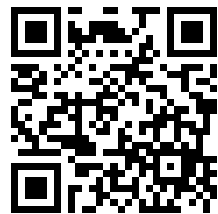

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OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUT.-COLONEL D. HARVEY, C.M.G., R.A.M.C.

ISSUED MONTHLY



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Journal
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Original Communications.

REPORT OF SCABIES INVESTIGATION.

BY CAPTAIN J. W. MUNRO.

Royal Army Medical Corps.

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INTRODUCTORY.

The purpose of this work, undertaken at the request and by the courtesy of the War Office, was to obtain a knowledge of the life-history and habits of the mite causing scabies in the Army, to ascertain its mode of spread and to improve the existing methods or, where necessary, to devise new methods, of dealing with it, based on that knowledge. In the literature relating to scabies and to the itch mite no two accounts of the life-history of the mite agree and there is a similar difference of opinion regarding its mode of spread or dispersal.

THE CAUSE OF SCABIES AND ITS RELATION TO OTHER ITCH MITES.

By scabies or itch is meant that form of acariasis caused by the itch mite *Sarcoptes scabiei* var. *hominis*, Mégnin.

The itch mites belong to the sub-family Sarcoptinæ of the family Sarcoptidæ, which is placed in the sub-order Acarina or mites. All the members of the sub-family Sarcoptinæ are parasitic in all stages, inhabiting the living tissues of their hosts. They are distinguished by the well marked transverse lines on the integument, by the transverse vulva, and by the mouth parts which are free. The genus *Sarcoptes* is distinguished from the other genera of the Sarcoptinæ by the following characters:—

The female has no copulatory or pairing tube; the anus is dorsi-ventral or terminal; both pairs of anterior legs in the female terminate in stalked suckers, as also does the fourth, or second posterior pair of legs in the male. The stalks of these suckers are not jointed.

Canestrini and Kramer (1899) gives the number of species in the genus *Sarcoptes* as eighteen, of which, however, they consider four are doubtful species. They state moreover that satisfactory taxonomic characters are difficult to find and that for better classification of the species physiological and biological characters may have to be considered.

Mégnin (1880, page 160) on the other hand considers all the members of the genus *Sarcoptes* as belonging to one species, *Sarcoptes scabiei* and reduces them to the rank of varieties. Thus *S. scabiei* de Geer, of Canestrini, is the *S. scabiei* var. *hominis* of Mégnin, *S. equi* Gerlach, of Canestrini, is the *S. scabiei* var. *equi* of Mégnin and so on.

No satisfactory description of any of the members of the genus *Sarcoptes* has yet been given. There is urgent need for a revision of

the genus, and careful study biologically and morphologically of its members. In the present paper it is believed that only one *Sarcoptes* is dealt with, which so far as descriptions can be relied on, most resembles *S. scabiei* de Geer, of Canestrini and Kramer (1899), and *S. scabiei* var. *hominis* Mégnin, as described by Railliet (1895, p. 674). It is proposed to retain Mégnin's nomenclature as it is less liable to cause confusion.

S. scabiei var. *hominis* is not the only *Sarcoptes* found on man. *S. scabiei-crustosæ* Fürst. is essentially a human parasite causing a severe form of scabies known as Norway itch. Several other members of the genus have also been recorded on man although he is not their normal host. Railliet (1895) gives the following as having occurred on man: var. *equi* Mégnin, var. *capræ* Mégnin, var. *cameli* Mégnin, var. *suis* Mégnin, var. *canis* Railliet, var. *cameli* Railliet, and var. *leonis* Railliet. These however only cause a more or less transitory affection and in the present investigation none of them has occurred; this however will be dealt with in another paper.

The mites of the genus *Sarcoptes* pass through three, and in the case of the female, four stages or phases before becoming mature, namely; the egg stage, the larval stage, and the nymphal stage, and in the case of the females, the second nymphal or immature female stage.

The human itch mite was first described by de Geer in 1788, who figured the female. Since his time numerous other figures of it, more or less accurate, have been given, the best being those of Robin 1869, and Mégnin, 1880. According to Blanchard (1890) the male of *S. scabiei* var. *hominis* was first discovered by Kramer in 1845, and was later seen by Eichstedt in 1846, and by Lanquetin in 1851. On the other hand Gerlach, (1857, page 50) gives Lanquetin the credit of its discovery and states that it was first figured by Bourguignon. There is no definite record regarding the discovery of the immature stages of the acarus of man, except a negative one regarding the first nymphal stage, which according to Dubreuilh and Beille (1895), has never been observed. The most studied and best known member of the genus is the Sarcopt of the horse and it is certain that with the exception of the observations of Gerlach, Gudden and Fürstenburg, the bulk of the known facts concerning the habits and the life-history of the Sarcoptid mites (s.s.) are to be referred to this species.

As previously stated all observations and experiments recorded in the following pages refer, it is believed, only to the one variety, namely, *S. scabiei* var. *hominis* Mégnin.

All the members of the genus *Sarcoptes* are parasitic on mammals, burrowing in the upper epidermis, where the females gnaw their egg burrows. Owing to an acrid fluid which they secrete their presence in the skin causes great local irritation. As a result of this local irritation the infested animal rubs or scratches the affected part and almost invariably aggravates the trouble. In man the scratching of the host causes almost as

much discomfort as the scabies itself, and the pyoderma, which results from scratching, is much more troublesome to get rid of than the mite which caused the preliminary irritation.

GENERAL DESCRIPTION OF *S. SCABIEI* VAR. *HOMINIS*.

All the active stages of *Sarcoptes* resemble one another in general appearance. They are all roundly oval in shape and, with the exception of the larvæ, are eight-legged. The dorsal surface of the body is furnished with scales, spines, and bristles in all stages, which, however, differ in distribution, size, and number, in the various stages and sexes. The anterior pairs of legs in all stages and both sexes terminate in stalked suckers. The mouth parts are chelate, or biting, and consist of a pair of chelicerae or mandibles, a pair of maxillæ and their palps, a labium, or lower lip, and two side pieces, the cheeks. All these are lodged in the camerostome, and form a rostrum or capitulum.

Dorsal Aspect.—The body is divisible into two more or less well defined regions—an anterior, the noto-thorax, and a posterior, the noto-gaster.

The Noto-thorax.—On the noto-thorax occur three pairs of bristles, an anterior pair, lying just below the camerostome, a small posterior pair, lying adjacent to one another, and a long, stout, whip-like pair probably corresponding to the pseudostigmatic organs described by Michael in the oribatid mites. In addition to these the noto-thorax bears three pairs of conical processes—the noto-thoracic cones, and one or more rows of triangular dorsal scales. On the lateral borders of the noto-thorax, and slightly anterior to the fold, separating it from the noto-gaster, are two pairs of bristles, of which the anterior pair is the longer.

The division between the noto-thorax and the noto-gaster is not always well defined. In the living, or fresh specimen, it appears as a deep transverse fold, and in the mounted specimen it is indicated merely by an interruption of the dorsal scales. This must not be confused with the more clearly defined bare area described below.

The Noto-gaster.—The vestiture of the noto-gaster consists of dorsal scales, stout bristles or spines, and two pairs of whip-like bristles lying on either side of the anal opening. The dorsal scales on the noto-gaster are, as a rule, smaller than those of the noto-thorax. The spines, called the noto-gastric spines, are very distinct, and are arranged in two rows on either side of the median line.

On the dorsal surface of the male the integument shows three well-defined rugose areas—one on the noto-thorax, and two on the noto-gaster. In the female and in the immature stages only one rugose area is present on the noto-thorax (see figs. 1 and 3).

The dorsal scales present in both regions vary somewhat in distribution or arrangement in the different stages or sexes. One feature of the arrangement of these scales calls for special mention, namely, that the scales in certain regions are reduced to mere wavy ridges, producing an

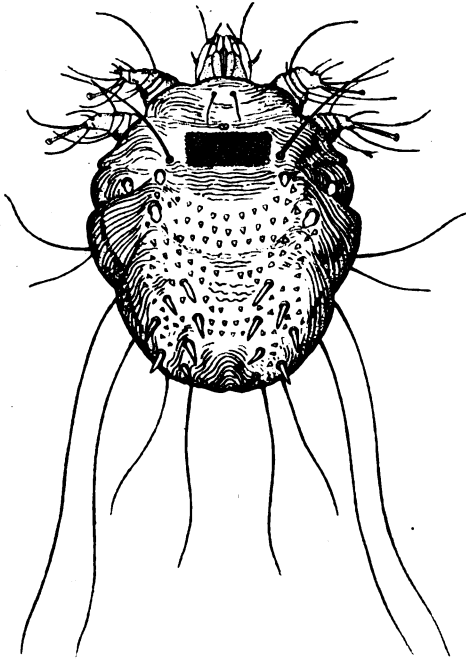


FIG. 1.—*Sarcoptes scabiei*, var. *hominis*. Female. Dorsal aspect. Magnified 120 diam. approx. (J. W. M. and H. W. W., del.)

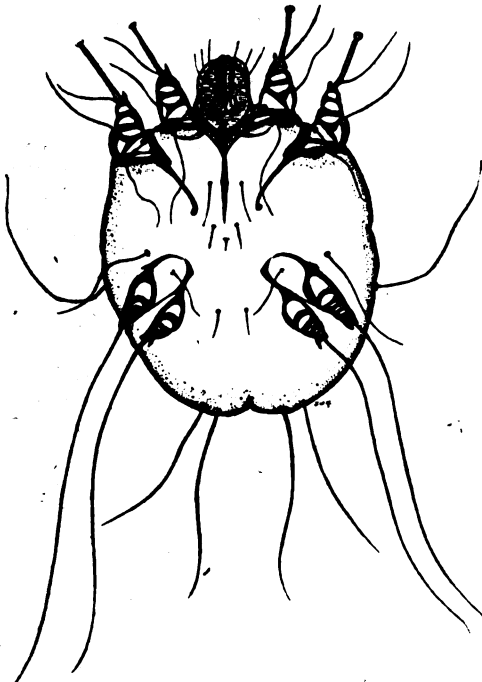


FIG. 2.—*Sarcoptes scabiei*, var. *hominis*. Female. Ventral aspect. Magnified 120 diam. approx. (J. W. M., del.)

apparently bare area (called by Railliet "clairière," and by Canestrini and Kramer "Blösse"). In some of the members of the genus two bare areas are present, noto-thoracic and noto-gastric; in var. *hominis*, however, there is only one, noto-gastric.

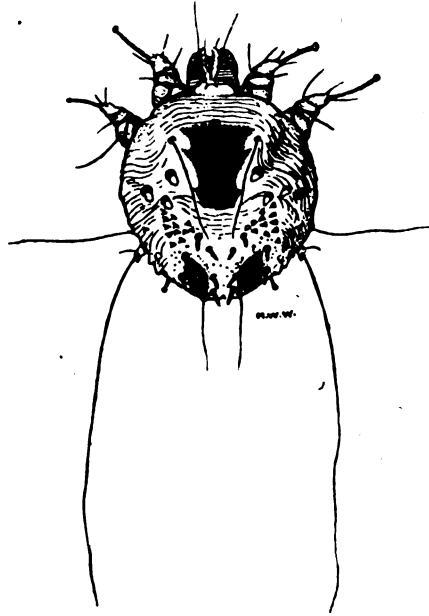


FIG. 3.—*Sarcoptes scabiei*, var. *hominis*. Male. Dorsal aspect. Magnified 120 diam. approx. (J. W. M. and H. W. W., del.)

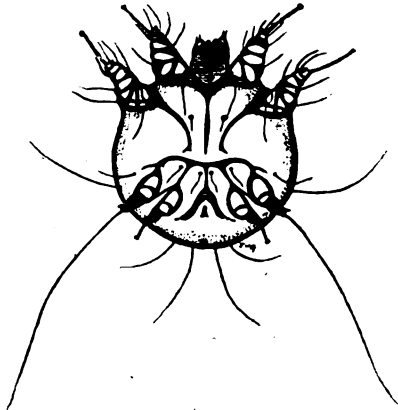


FIG. 4.—*Sarcoptes scabiei*, var. *hominis*. Male. Ventral aspect. Magnified 120 diam. approx. (J. W. M., del.)

The size and shape of the dorsal scales in *Sarcoptes* have been made use of for taxonomic purposes, but it is doubtful whether they have any such value.

Ventral Aspect.—Viewed ventrally, the two regions of the body are more easily recognized, as the legs arise from the ventral surface. Both regions are destitute of scales or spines, but show a distinct variation in the number and arrangement of the various pairs of bristles according to age and sex. These are shown in figs. 2 and 4.

The most marked features of the ventral surface are the epimeres, or articulations of the legs with the body.

The epimeres of the first pair of legs are united and form a thin rod lying in the median line. The epimeres of the second pair of legs are not united and lie on either side of the median line. In the mature female the tocostome, or egg-laying orifice, can be seen as a transverse slit, situated just below the epimeres of the anterior legs.

The epimeres of the posterior legs call for no special mention, except that in the male they are united in pairs.

The genital armature of the male, called the epiandrium, lies between the epimeres of the fourth pair of legs, and its anterior arm is more or less intimately united with these epimeres.

The following is a short detailed description of the various stages and sexes.

DETAILED DESCRIPTION OF *S. SCABIEI* VAR. *HOMINIS*.

The Female.—Length, 330 to 450 microns; breadth, 250 to 350 microns; rugose area rectangular; dorsal scales numerous, bare area noto-gastric, small; noto-gastric spines fourteen in number; posterior legs, two pairs, ending in long bristles; epimere of first legs pointed, epimeres of second legs ending in a club; tocostome and tocostomal bristles present.

The Male.—Length, 200 to 235 microns; breadth, 145 to 190 microns; rugose areas three in number; one noto-thoracic, two noto-gastric; dorsal scales few in number, bare area ill-defined; noto-gastric spines twelve in number. Fourth pair of legs ending in suckers. Epimere of first pair of legs pointed, epimeres of second pair of legs forked, epimeres of third and fourth pairs of legs fused, more or less intimately connected with the anterior arm of the epiandrium.

The Immature Female.—Length, 220 to 250 microns; breadth, 170 to 200 microns; rugose area rectangular; dorsal scales numerous, bare area noto-gastric small; noto-gastric spines twelve in number, third and fourth posterior legs ending in bristles; epimeres of anterior pairs of legs forked. Tocostome and tocostomal bristles absent.

The Nymph.—Length, 160 microns; rugose area indistinct; dorsal scales numerous, bare area well defined; noto-gastric spines twelve in number. Fourth pair of legs ending in bristles which are shorter than those of the third pair; only one pair of anal bristles present. Epimeres of anterior pairs of legs forked.

The Larva.—Length, 110 to 140 microns; breadth, 90 to 110 microns; rugose area ill defined; dorsal scales except at the sides, indistinct,

producing an apparently large bare area ; noto-gastric spines ten, fourth posterior legs absent. Epimeres of anterior pairs of legs forked. Only one pair of anal bristles.

RELATION OF SARCOPTES TO DISEASE.

"In the past typhus and typhoid played fearful havoc in the field and camp ; these diseases medical science has curbed—a triumph amply recognized. The scourge of scabies survives, however, to the present time." MacCormac, 1917.

One of the features of the present war is the important part played in the causation of disease by external body parasites, notably by the louse and the itch mite.

The part played by the louse in causing disease has been long recognized and the louse problem is nearing solution, largely owing to its gravity being demonstrated by the recent discovery that the excrement of the louse conveys trench fever. On the other hand the importance of the itch or scabies mite as a cause of disease has been greatly underestimated, and is even now recognized only by a few of our medical authorities. The majority of medical officers, have, until recently at least, failed to appreciate it because, in many instances, they have failed to detect the disease when it was present.

Scabies in the Army may be said to assume two forms, the simple and the complicated. In the former case the disease resembles scabies as seen in civil life. In the latter case complications arise, in which the original disease is masked by a variety of forms of skin sepsis, such as boils and impetigo and by dermatitis and pediculosis.

In dealing with scabies therefore, complications must be looked for and the initial disease and its sequelæ duly recognized. Scabies and its complications may be classified as follows :—

- (1) Simple scabies.
- (2) Scabies and scabitic (ecthymatous) impetigo.
- (3) Scabies and boils or furunculosis.
- (4) Scabies and sulphur dermatitis.
- (5) Scabies and pediculosis.
- (6) Scabies in combination with any two or even with all of the foregoing.

(1) *Simple Scabies*.—By simple scabies is meant the disease caused by the presence in the skin of the itch mite or acarus.

The disease is recognized by the presence of vesicles and fine tortuous linear burrows, containing the acarus, on well-defined regions of the body and limbs, accompanied by reddish papules near these regions and by complaints of itching on the part of the patient.

Simple scabies is the forerunner of complicated scabies but is nevertheless comparatively rare in practice owing to the hesitancy on the part of the soldier to report sick for an apparently trivial complaint and to the

rapidity with which complications set in under the conditions unavoidable on military service.

Out of forty consecutive cases of scabies admitted to hospital during three days, only three cases, or 7·5 per cent, were simple scabies.

According to the chart given by MacCormac (1917), of skin admissions into hospital "B" in France, out of 1,000 cases diagnosed scabies, boils, or impetigo, twelve per cent were simple scabies.

(2) *Scabies and Scabitic (Ecthymatous) Impetigo*.—This form of complicated scabies is the one most commonly met with. In it the ordinary lesions of scabies are present and recognizable but they are often masked by the impetigo. MacCormac describes the impetigo as of an ecthymatous type caused by streptococcal infection. "Its distribution on the buttocks, and frequently over the elbows and knees is very characteristic." This form of scabies, according to MacCormac's chart already referred to, accounts for fifty per cent of the cases diagnosed; and in the scabies ward of the hospital, where scabies and its complications alone are considered, it accounts for between fifty and sixty per cent of the cases.

The cure of this complication is slow, it lasts from a month to six weeks and it is the form of scabies which causes the greatest loss and inefficiency in the Army. It is unfortunately often wrongly diagnosed, its scabitic origin being completely overlooked.

(3) *Scabies and Boils*.—This form of scabies is less common than the impetigo type. MacCormac states that "boils form 28·4 per cent of the pyodermic complications of scabies, either alone or associated with impetigo."

The boils occur commonly on the buttocks, and on the upper and lower extremities, particularly in the neighbourhood of the wrists and elbows and of the knees.

(4) *Scabies and Dermatitis*.—This aspect of scabies is almost entirely confined to cases which have been treated, either at their units or in hospital. The condition is due either to too prolonged or too frequent an application of sulphur or to the use of too strong an ointment.

The upper and lower extremities, particularly the lower arms and the thighs, are the chief regions affected. The prevalence of dermatitis is difficult to estimate. It varies according to the methods of treatment employed.

(5) *Scabies and Pediculosis*.—This combination is comparatively rare in the Home Forces and occurs chiefly in isolated units which have little or no bathing facilities.

In France, Semon and Barber (1917) have found that the combined infection, scabies and pediculosis, amounted to 5·5 per cent of all pyodermic infections; scabies alone accounting for 37·6 per cent, pediculosis alone for 56·9 per cent.

The presence of long and deep lesions, due to scratching and of melanoderma serves to indicate pediculosis, where no lice or nits are actually found.

(6) *Combinations of Scabies with one or more Skin Infections.*—Cases occasionally occur in which the scabies is accompanied by several complications. They are as a rule due to neglect on the part of the soldier, although unfortunately medical officers are sometimes responsible.

In such cases the scabies may be completely masked and is almost always unrecognized.

As an example may be cited a case suffering from scabies, phthiriasis, pediculosis and impetigo, and which was sent into hospital with the diagnosis "eczema."

(7) *Relation of Scabies to Trench Fever.*—The researches on the etiology of trench fever carried out by the American Red Cross in France and at the Hampstead Military Hospital in England indicate an additional danger arising from the prevalence of scabies. The sufferer with scabies is especially susceptible to inoculation with trench fever owing to his constantly scratching himself. Major Byam, in a paper read before the Society of Tropical Medicine, calls attention to this and insists on the urgent need of more effective measures against scabies in the control of trench fever.

Note.—Since the above was written Lieutenant-Colonel Gray, R.A.M.C., informs me that much of the ecthymatous impetigo seen at base hospitals and which is there attributed to scabies, is probably in a large part due to pediculosis, of which the patient is cured in the casualty clearing stations or other hospitals before he reaches the base, and the part which is played by the louse is either minimized or overlooked.

The following charts, kindly lent by Professor Nuttall, who received them from Colonel Beveridge, R.A.M.C., of the 46th Division, B.E.F., show the relation of scabies to pyodermic infections generally (I.C.T.), and serve to illustrate the value of weekly inspections in keeping down scabies and its sequelæ. Major Kay's remarks on them are as follows:—

"The charts I enclose include the period from the beginning of October to the end of March, 1917. The chart marked 'A' shows the weekly admissions for scabies, I.C.T.¹ and P.U.O.,² and as these are looked upon as the three dirt diseases, I had it made out to see if these incidences had relation to each other. You will see from it that, as the admissions for scabies decreased, so also did the admissions for I.C.T. There has also been a slight fall in P.U.O., but not in my opinion in the same proportion as the others. While scabies and I.C.T. have always been high in the division, P.U.O. has been low compared with other divisions in the same Corps.

"Chart 'B' shows the total daily scabies remaining in hospital. When

¹ I.C.T.=Inflamed cellular tissue. A general term used in the Army to indicate cellulitis and apparently certain pyodermic infections also.

² P.U.O.=Pyrexia of unknown origin. An Army term. In many cases the pyrexia would seem to be trench fever.

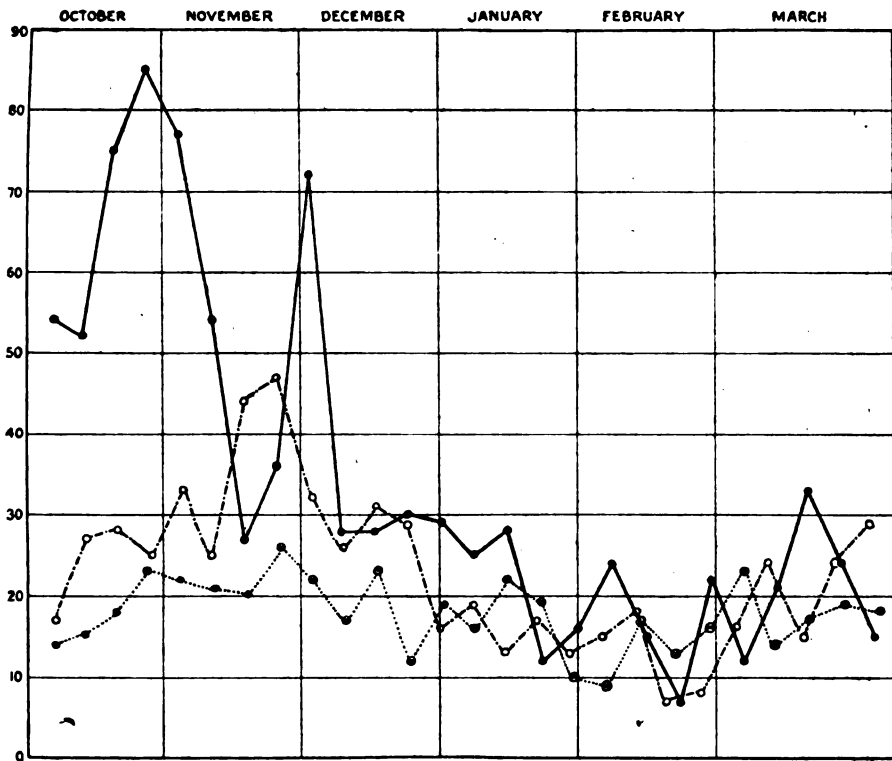


Chart A, showing weekly admissions into hospital of scabies I.C.T. and P.U.O.
 = P.U.O. -.-.- = I.C.T. — = Scabies.

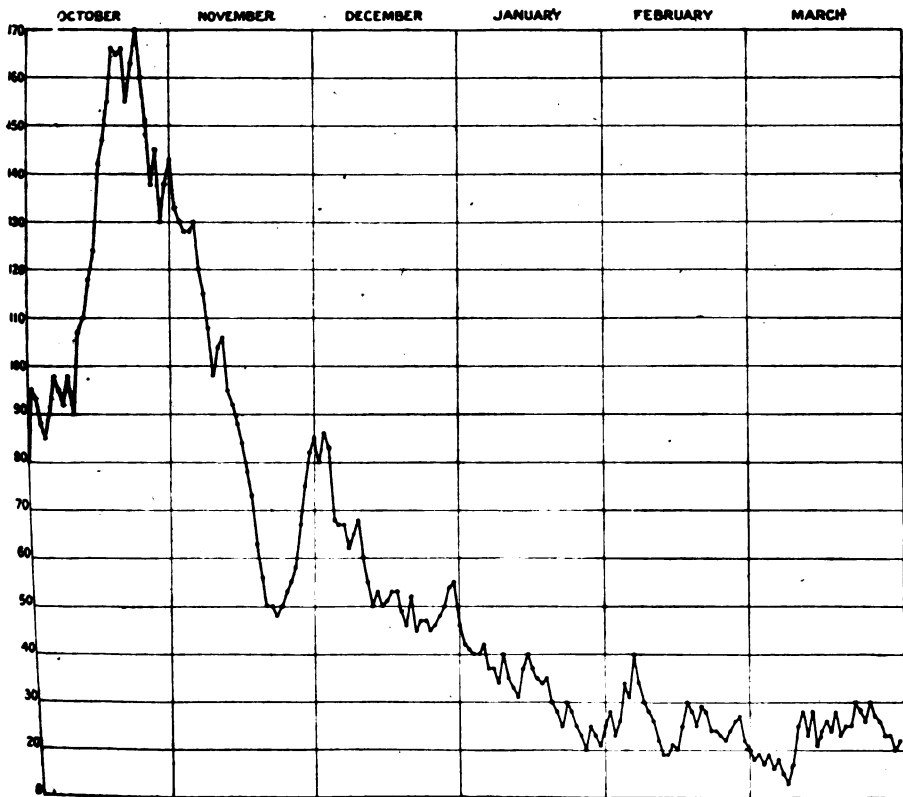


Chart B, showing number of scabies remaining in hospital daily.

Report of Scabies Investigation

I took over the Division in September I started a vigorous campaign against scabies. Orders were given for :—

- “(1) Weekly inspections.
- “(2) Change of clothing and bath weekly, when possible.
- “(3) The blankets of scabies patients, and all the blankets in the same billet to be threshed¹ immediately the case has been detected.
- “(4) All blankets to be threshed at least once every three weeks.
- “(5) No canvas to be used on wire beds.
- “(6) Straw not to be used in billets.

“Form ‘C’ is sent in by the regimental medical officer with each patient. If more than a week has elapsed since the previous inspection an explanation is asked for.

“C.”

FORM “M.F. 4” FOR REPORTING SCABIES CASES.
Reference R.A.M.C. Circular Memo. No. 100.

Unit.....

Number	Rank	Name	Date of detection	Dates of last two previous inspections

Date..... Sd. M.O. i/c.....

“Form ‘D’ is attached to the Pay Books of men on detached duty, and the date of each inspection is entered on it and signed by the medical officer who makes the inspection.

“D.”

..... Pte. Regt., is employed as and will report weekly at the hour of Sick Parade to the nearest Medical Aid Post or Dressing Station for Scabies inspection by the Medical Officer.

Date	Signature of M.O.	Date	Signature of M.O.
.....
.....
.....
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¹ Threshed—An Army term used to designate the disinfection of fomites by the Thresh disinfectant. See Nuttall [“Combating Lousiness”], 1918.

"You will see from the chart that the result of more careful inspections was a large increase at first in the number admitted to hospital. To begin with there was an inclination in some regiments to keep cases back, but commanding officers and medical officers began soon to see the advantage of the early detection of scabies, and now do everything in their power to help. The rise at the end of November was due to the weekly inspections not having been carried out thoroughly in some of the regiments.

"In my opinion the reduction of scabies in the division has been chiefly due to the detection of the cases at once, before they can spread the disease, and also to the disinfection of blankets and the removal of canvas from the wire bed.

"The number of scabies patients in the Division would have been less than it is, but, lately, quite a number of men have returned from leave with scabies, and also reinforcements from the base.

"I think more might be done in England to prevent infected men coming to France.

"One week I got twenty reinforcements from another Division with scabies; this accounts for the rise at the end of January."

THE ORIGIN OF MATERIAL STUDIED.

All the material used was derived from scabies patients at the 1st Eastern General Hospital, Cambridge, where facilities for the study of scabies were granted by the officer commanding, Colonel Griffiths. The experimental and microscopical parts of the work were carried out in the Quick Laboratory, Cambridge, under Professor Nuttall, and later experiments on the infectivity of clothing, etc., were carried out at the Cambridge Research Hospital lent for the purpose by T. P. Strangeways, Esq.

It should be noted that scabies cases arrive at the 1st Eastern General Hospital from all parts, from the Home Forces and from Overseas. The hospital also receives cases which have been partly treated and numerous cases of so-called impetigo and boils which are scabitic in origin. On the whole therefore the scabies cases studied at this hospital may be considered typical of scabies as it manifests itself in the Army. The acari obtained from cases at the 1st Eastern General Hospital are all similar and in my opinion are undoubtedly of the same species.

METHODS OF OBTAINING MATERIALS.

The material for study and experiment was obtained by removing eggs and adult mites from burrows on the person of the patient. Adult and immature female acari were readily obtained by removing them from the end of their burrow with a dissecting needle. The use of a magnifying glass or lens of moderate power, eight to fifteen diameters was necessary to insure the removal of the mite without injury. Acari thus obtained, intended for biological experiments were then placed in small corked test-

tubes containing small pieces of moistened filter paper or were placed in an artificial burrow made by passing a needle under the skin, on the writer's wrist. Acari intended for microscopic examination were removed from the burrow to the slide and mounted directly.

Eggs were obtained in the same manner as the females but the active immature stages could not be obtained in this way owing to the difficulty of finding them and the time involved in picking them out. They were obtained from infected volunteers by examining the burrows and the region surrounding them with a binocular microscope. They were often injured by crushing and finally it was found that larvæ were best obtained by hatching the eggs in the incubator.

By scraping the neighbourhood of the burrows with a scalpel and examining the scales and crusts obtained, larvæ, nymphs and males were found but as this method involved the abrasion of the host's skin it was employed only on one occasion.

METHODS OF REARING AND OBSERVATION.

In studying the development of the egg two methods were adopted. In the first a mature female acarus was transferred to the wrist of a volunteer, an artificial burrow being made for it by passing a needle under the skin. The female in the great majority of cases commenced burrowing and egg laying. By removing the roof of the burrow with a dissecting needle, under the binocular microscope, the eggs could be observed, and removed for examination to be replaced immediately. In some cases the eggs were left *in situ* and examined every few hours until the larvæ emerged. Eggs intended for hatching in the incubator were removed from the burrows and placed in a glass cell consisting of a microscope slide on which a glass ring covered by a cover glass was placed. This cell was then placed on a glass plate and the whole covered with a Petri dish lined with moist filter paper. Eggs intended for experimental purposes were removed from the body and kept in small glass tubes containing a wad of filter paper and closed with a cork.

The active stages of the mite used in the experiments on habits were confined on the arm, wrist, or other parts of the body by a cell consisting of a glass ring covered by a microscope slide which was held in position by elastic bands, bandages or straps according to requirements. The object of such a cell was to prevent the mites from wandering and to facilitate observation. It enabled them to burrow as the bottom of the cell was, of course, the host's skin.

All attempts to rear mites on small portions of human skin away from the body failed as the skin either dried up, or, if kept moist, swelled up and became spongy.

BIOLOGY.

Excavation of the Egg Burrow.

The mother acarus deposits her eggs in a burrow excavated by her in the human epidermis. The parts of the body which she selects for her burrowing and oviposition are well defined and are as follows: the interdigital spaces, the wrists and the ulnar margin of the wrists, the elbows and the anterior folds of the axillæ, the penis, scrotum and buttocks, the back of the knee and the ankle and toes. In young children the egg burrows may occur on any part of the body and in women the underside of the breasts is very commonly selected.

Acari which are confined under a cell (see methods, p. 14) on other parts of the body than the sites indicated, will burrow on these parts, but if the cell be removed to allow of their wandering, they will leave these parts for the nearest sites usually selected. On several occasions I have confined female acari on the forearm and in every instance they burrowed enough for concealment, but on the cell confining them being removed, they left these burrows and were recovered on the wrist after periods varying from twenty minutes to two and a half hours.

The ovigerous female proceeds to form the egg burrows after her last moult. She fixes on to the skin by the suckers on her anterior legs and, propping her body up with the bristles on her posterior legs, assumes an almost perpendicular position and commences cutting the skin. She very soon bores in, being completely concealed in as short a period as two and a half minutes. Once concealed she may continue boring or may rest for a period. This largely depends on the warmth of her host's body. At a low temperature or when the body of her host is cold she ceases burrowing, but commences burrowing again on a slight rise of temperature or warming of the body.

During January and February the writer carried out a number of experiments to test the rate of burrowing of the females. The acari were placed on the wrist and allowed to burrow in. The laboratory temperature was low and, in all instances but one, the females concealed themselves under the epidermis until the writer entered a warm room when they commenced burrowing again. If, however, the hand was held over a radiator or other source of heat the mites commenced to burrow and it was possible by alternately warming and cooling the hand affected to regulate the rate of burrowing.

Under normal conditions the burrowing period corresponds more or less to the time spent in bed, roughly eight hours. The average length of a burrow excavated daily was two to three millimetres.

Oviposition.

Oviposition commences almost simultaneously with the burrowing and proceeds in a definite relation with it as the following experiments show:

Experiment 1.—February 4: Adult female removed from its egg burrow on patient's wrist to the writer's left wrist and burrowed in 4 p.m. February 5: Two ova found in burrow at 9 a.m. February 8: Larvæ and three ova in burrow at 10 a.m.

Experiment 2.—February 11: Immature female moulted and left burrow on writer's wrist at 11.15 a.m., crawled a distance of twenty-five millimetres and burrowed again. February 12: One egg in burrow removed 10 a.m. February 14: Another egg and one larva found.

Experiment 3.—March 11: Burrow begun by ovigerous female on March 5 completely removed from wrist. It contained eight unhatched eggs, one empty egg shell, and one larva. Total nine eggs in six days.

In experiment No. 1, the acarus was an ovigerous female which had already laid several eggs. In experiments 2 and 3, the acari were females which had just attained the adult state.

In the majority of the burrows the eggs are laid in groups of two or even four. Between these groups the burrow is as a rule empty of excrement which is found in the neighbourhood of the egg groups "in black scybalous masses," as described by Hebra.

The grouping of the eggs and the excrement indicates that the female burrows for a space, rests, and deposits one or more eggs, and resumes burrowing again. If a female is disturbed during the day, eggs are almost invariably found just behind or even under her body, but if she is disturbed at night when the host's body is warm (either from the warmth of blankets or a fire), she is usually found in advance of the last group of eggs. Bourguignon points out that the dorsal spines prevent retrogressive movement on the part of the acarus in her burrow.

Number of Eggs Laid.

The number of eggs laid by the *Sarcoptes* of man is not easily determined, although it is certain that if undisturbed the female lays them all in one burrow. Gerlach p. 57, states that the most careful observations show that the female dies in her burrow and that a second pairing does not take place. The writer's experience confirms this observation. Gudden (quoted by Gerlach) estimates the total number of eggs laid by the acarus in her lifetime at between forty and fifty. Gerlach with certainty counted up to twenty-one. He estimates the number laid daily at not less than two and gives the total duration of the life of the acarus as from four to five weeks. Blanchard quotes Gudden's figure but also states that the period of oviposition is four to six weeks with an average of two eggs per day, which would give a much higher figure.

Mégnin estimates the total number of eggs laid at fifty. Hebra states that the acarus of man lives from twenty to forty days or even longer, laying one egg per day. Generally speaking forty to fifty would appear to be the total number of eggs laid by the human *Sarcoptes*.

The different estimates of workers is easy to understand, the roofs of

the burrows soon become abraded and the egg shells are rubbed away in washing. The maximum number of eggs which I have obtained in one burrow is fourteen, but two of these were hatched. Gudden (according to Gerlach), found on one occasion fourteen and on another twenty-one eggs hatched and unhatched, while he found from time to time as many as eight to fourteen unhatched eggs. Gerlach himself thinks one to eight is the average in the burrow.

The number of eggs found in the burrow may of course vary enormously according to the age of the burrow. The longest burrows are found on the wrist and around the ankles where they are less scratched or rubbed.

The Hatching of the Egg.

According to Bourguignon, already quoted, the egg of the *Sarcoptes* is ready to develop immediately.

With the scabies mite, there is considerable difference of opinion in the literature regarding the period of hatching of the ova. Bourguignon gives the normal period of hatching as ten days, Fürstenburg six to seven days, Mégnin (quoted by Dubreuilh and Beille) forty-eight hours, and Gerlach sixty-four to seventy-six hours. The last named emphatically states that the periods given by Bourguignon and Fürstenburg are wrong and it must be said that the account of the experiments he himself carried out is most convincing. It is as follows:—

I have made a series of experiments on the hatching and in this simple manner: I laid the eggs in a hollow in a glass slide, placed a small drop of water in it and fastened another glass plate over this, by means of indiarubber bands. This apparatus was then bound to the arm with a cloth and every twelve hours it was removed and a drop of water or saliva allowed to flow between the glass plates. In other cases I carried this hatching apparatus in a pocket on my person and obtained the same result. By this means I have hatched fresh and older eggs within three days and at the most within three days and a few hours. Dr. Burchart, who by his great interest in the subject has assisted me in the friendliest manner, in the most varied researches, and has helped me to obtain the eggs of the mite, himself hatched a mite egg, with this modification, that he carried the hatching apparatus in a pocket on his person during the day and laid it aside at night, so that the egg became cold and hatching was interrupted. In this case the emergence was delayed for five days after seventy-six hours development. The eggs were obtained in this way; several females were taken from their egg burrows, to these an egg was often attached hanging from the legs and sometimes an egg was laid during the first twelve hours of their removal. Before the experiment the eggs were tested microscopically to determine whether they were fresh or not, the fresh eggs being recognized by their uniform ungranulated contents. Partly developed eggs were also experimented with and hatched in one or two days. The following is a short summary of the results obtained in this way:—

- (1) Freshly deposited eggs hatch out in from sixty-four to seventy-six hours.

(2) Interruption of the development does not prevent hatching, but development and emergence are prolonged by some hours.

(3) Eggs, removed from the skin, remain capable of hatching for several days (up to ten days is certain, but longer periods have not been tried) providing that they are not shrivelled by too high temperature and dry atmosphere. Eggs of the horse mite *S. var. equi* were found still capable of hatching after three to four weeks.

Eggs which have begun to develop and in which development has been interrupted still retain their power of hatching on the return of suitable conditions. The further development has advanced, the less they retain their power.

Gerlach then describes the development of the embryo in the egg, which adds weight to his other observations.

Personal Observations on the Hatching of the Egg.

The writer's observations on the hatching of the egg on the host were made by careful periodic examination of the egg burrows on the writer's wrist, or on those of civilian volunteers. They refer to the time elapsing between the beginning of the burrow and the finding of the first larva.

Experiments on the hatching of the egg away from the body, *in vitro* and on clothing, were made as follows: Female acari were removed from their egg-laying burrows and allowed to excavate new ones. As soon as eggs were laid in these new burrows they were removed and examined in a drop of water between an ordinary microscopic slide and cover-glass. This enabled their freshness to be ascertained. The eggs were placed in an ordinary glass cell between glass slides kept in a Petri dish or other vessel lined with filter paper which was moistened as required. In Experiments A and B the eggs were kept in glass tubes (1½ inches long and ⅜ inch in diameter) next the body.

In Experiments Nos. 1 and 2, already quoted, the times which elapsed between the beginning of the burrow of the female and the finding of the larva were seventy-eight to seventy-one hours. Numerous observations made throughout the investigation have confirmed these, the average being seventy-two hours. This of course represents a longer period than the actual hatching took. Experiments on the newly deposited eggs placed in a cell as described, in a thermostat or tube carried on the person, gave results as follows: Series "A" were carried out in the thermostat at 29° to 30° C., Series "B" on the person. Only two eggs were experimented with at a time owing to the difficulty of obtaining them.

		Egg No. 1		Egg No. 2	
"A"	1	..	80 hours	..	Failed to hatch after 96 hours
	2	..	74 "	..	75 hours
	3	..	70 "	..	72 "
	4	..	74 "	..	78 "
	5	..	68 "	..	72 "
"B"	1	..	92 "	..	94 "
	2	..	81 "	..	87 "
	3	..	78 "	..	Failed to hatch after 120 hours
	4	..	98 "	..	103 hours

In Series "B" it will be seen that the period of hatching is on the average ten hours later than in "A." This is probably due to the fact that the tubes were removed from the body during the night and replaced in the morning. In a third series of experiments recently deposited eggs were placed on ordinary flannel shirting and exposed to the laboratory temperature 6° C. for period of one to eight days, and then hatched in the incubator. Two eggs were tested in each case. The controls were kept in the incubator as in "A," except in Experiment No. 4 of the series, when there was no control.

Period of Hatching.

No.	Exposure	Control	Experiment
1 ..	24 hours	68 hours	82 hours
2 ..	48 "	70 "	88 "
3 ..	96 "	72 "	Failed to hatch, dried up
4 ..	120 "	None	96 hours
5 ..	144 "	Failed to hatch ..	103 "
6 ..	168 "	70 hours	103 "
7 ..	192 "	67 "	Failed to hatch
8 ..	216 "	69 "	" "

These experiments confirm Gerlach's observations, but a fuller study of the various factors affecting hatching is desirable. The writer has, however, failed to hatch eggs exposed to ordinary temperatures for periods of more than six days as the eggs shrivelled or collapsed.

In comparing the experiments in "A" and "B" it should be noted that in "B" the temperature was higher (33° to 35° C.) as the tubes were carried next the body in the region of the armpit. It may be assumed that if uninterrupted the hatching in these series would have been more rapid than in series "A." Attempts were made to hatch eggs in artificial burrows made in the skin by passing a needle under the epidermis, but these all failed as the eggs were crushed in placing, or the skin covering them was rubbed or washed off.

The shortest period of hatching was sixty-seven hours (control Experiment 7 of series "C"). The longest period was one hundred and three hours (series "B" and "C"). This long period was undoubtedly due to the interruption of development in series "B" by cooling during the nights, and in series "C" by exposure to low temperature, which delayed development.

It is probable that Gerlach's statement that development may be delayed for ten days without injury is correct.

One point of interest may be mentioned: Railliet quotes Bourguignon to the effect that *S. scabiei* var. *hominis* may be viviparous, and Blanchard has shown that development may commence before oviposition. The writer has seen a female of the sheep *Sarcoptes*, *S. scabiei* var. *ovis*, which contained an egg in which the larva was fully developed, and it is quite probable that *S. scabiei* var. *hominis* may, under some conditions, be viviparous or ovoviviparous.

Ova have never been obtained from acari removed from the body of their host, although Gerlach seems to have obtained them.

Effects of Immersion on Hatching.

A limited number of experiments on a small scale on the effect of immersion in water on hatching were carried out. Although very limited in scope, they are not without interest.

Eggs kept in water at 15° C. for three days, and then placed, still immersed, in the incubator at 30° C., hatched in seventy-eight to eighty hours. If immersed and immediately placed in the incubator at 30° C., they hatched in from sixty-nine to seventy-six hours. In these experiments the eggs were simply placed in an excavated glass slide, the hollow being filled with water. They were covered by another slide, and then by a Petri dish lined with moist filter paper.

The Larval and Nymphal Stages.

Owing to the great difficulty of obtaining larvæ and nymphs, even when numerous scabies cases were available, it has not been possible to study the life and habits of these stages in any detail. Larvæ are easily obtained, but are extremely delicate and shrivel on quite a short exposure to dry conditions, and in summer to the ordinary conditions of the atmosphere.

The first nymphal stage which, according to Dubreuilh and Beille, has not been found in *var. hominis*, was obtained by me on two occasions. The second nymphal stage has been more frequently obtained, and is more easily observed.

In searching for these stages, various methods were employed. Complete burrows and the surrounding skin were removed. This method yielded larvæ, and on one occasion a first stage nymph. Unfortunately however the transitions from the larval stage to the first nymph, from the first nymph to the second nymph, and from the first nymph to the male, have not been observed. All that can be said is that all the stages mentioned have been obtained.

On the other hand, it has been possible to determine the time elapsing between the egg stage and the second nymph, or immature female and mature female stages, by observing solitary females and their eggs and larvæ, and noting the times of appearance of the first new burrows which are those of the males and second nymphs.

The Habits of the Larvæ.

Larvæ are found in the egg burrows and also by scraping the skin in the neighbourhood of the burrows. They have also been obtained from the neighbourhood of isolated vesicles. On opening an egg burrow from the blind end, eggs are found immediately behind the mite, and for some distance back; then, as a rule, the needle punctures a vesicle, and

the serous fluid from it floods the burrow. This usually prevents further search until the fluid dries up, when larvæ may be found. It should be noticed that the vesicle lies below the floor of the burrow. As the larvæ are usually found in the neighbourhood of the vesicles, the writer concludes that they are the cause of these vesicles, a conclusion which is borne out by the removal of larvæ from the isolated vesicles, some distance from the egg burrows. Gerlach (p. 61) states that the larvæ bore into the thicker epidermis, and more deeply than the females, and confirms Gudden's observation that the young stages bore most deeply. He also states that as a result of this deep boring an exudation takes place under the epidermis which probably provides food for the larvæ.

In experiments conducted on the larvæ by placing them on the arm and wrist surrounded by a glass ring covered with a glass slide fixed to the arm by elastic (see p. 14), the larvæ took refuge in the hair follicles and bored in. In four instances vesicles arose and from three of them larvæ were recovered an hour after the appearance of the vesicle. In many of these experiments however the larvæ were lost. In one instance when four larvæ were confined together and apparently lost, a burrow containing a mature female was found six days later. This indicated that two of the larvæ of opposite sex survived. The greatest difficulty was experienced in observing larvæ on the skin. They are just visible to the naked eye but can only be recognized by their moving and it is not possible to confine them without causing great inconvenience to the person on whose skin they are placed. The observations made were unavoidably irregular and confined to short periods. They show however that the larvæ live in the burrows and bore in the floor of the burrows. They also wander from the burrow and bore in the hair follicles, causing isolated vesicles.

Gerlach (p. 56) states that newly emerged larvæ placed on cloth attempt to bore in, and compares their behaviour to that of a young mammal seeking its mother's breast.

No moults have been observed in the larval stage and larvæ newly emerged when compared with those of twenty-four to thirty hours old show no variation in arrangement of the bristles nor in the epimeres, the only reliable indications of moulting. Hebra, Railliet, and Dubreuilh and Beille on the other hand state that two or three moults occur, although Hebra's statement probably refers to the nymphal moults. Blanchard and Gerlach make no reference to moulting on the part of the larvæ. Fürstenburg (p. 199) states that the larvæ which become males have the epimeres of the third pair of legs united, while in those larvæ which become females there is no union. I have been unable to confirm his observation, and doubt its accuracy.

Attempts to rear the larvæ away from the body of its host were unsuccessful, in three instances the larvæ lived over thirty hours (thirty to thirty-two) but none moulted and many lived only a few hours (three to

eight). Probably the lack of food was one cause of their dying, but many shrivelled from lack of moisture and others appeared drowned by excess of it, becoming soft and swollen.

The First Nymphal Stage.

So far no observations have been made on this stage owing to the lack of material. According to Dubreuilh and Beille the first nymph was previously unknown in var. *hominis*.

The Second Nymphal Stage.

The second nymphal stage of var. *hominis* has been found only in burrows resembling those of the mature female. The burrows are smaller however and are unaccompanied by vesicles. Pockets or short blind branch burrows may be found opening into them, which are the work of the male.

The second nymphs or immature females have been observed on five occasions to be accompanied by males, and in one instance the two sexes were in contact. They were unfortunately separated in mounting, but there is reason to believe that they were pairing. On the other occasions the males occurred in the same burrows as the nymph or, as in two instances, in branch burrows adjoining. The second nymph moults in the burrow which she makes, leaving the cast skin in it. She is then a mature female and proceeds to make the egg burrow proper. Hebra quotes Fürstenburg and Gudden, showing that they recognized the second nymphal stage. Mégnin states that there are two types of nymph, large and small, the larger giving rise to the female and the smaller to the male acarus. It is possible that he confused the first and second stage nymphs, but his statement is worthy of consideration.

Duration of the Larval and First Nymphal Stages.

The periods given below for the duration of the larval and first nymphal stages are those ascertained by noting the first appearance of the larvæ and the first appearance of the males and the immature females on subjects known to be free from scabies until infested experimentally. The method adopted was as follows: Mature females were removed from their burrows on the person of scabies-infested soldiers, and were immediately transferred to the wrist of the volunteer. The wrist was selected because it is the most convenient part of the body for examination and because it is one of the chief sites affected in nature. Throughout the investigation the experiments were necessarily carried out in no regular sequence, but from time to time as occasion offered. The greatest care was necessary to insure that volunteers, the subjects of previous experiments, were completely free of acari, and a week was allowed to elapse after treatment as a precaution against imperfect cure. There is no reason to believe that in any of the experiments fresh

burrows or acari came from any other source than the eggs of the mother acarus used in the experiment. Fresh clothing was always used for each experiment and every precaution was taken to prevent chance infection.

After the female had buried herself in the skin of her new host, two full days were allowed to elapse before the burrow was opened, although the progress made by the female was noted morning and evening. After the third day of infection the burrow was opened for a short distance (about half its length), but care was taken not to displace the eggs. These, however, adhere to the floor and sides of the burrow, and were in the majority of cases undisturbed, as the empty egg shells were found in later examinations. On the first examination larvæ were found only in a few instances, but on the second (the fourth day of burrowing), one to three larvæ were usually obtained. These were carefully covered up by replacing the roof of the burrow and left undisturbed. A careful watch was now kept for isolated vesicles as indicating the presence of the nymphs, but while vesicles were found in several instances, only one first stage nymph was obtained. The second stage nymphs were however easily observed, and also the males. From the beginning of the egg burrow to the appearance of the first immature female, or of the male, the average interval was seven days. The minimum was six days and the maximum eleven days. This last interval was probably due to the failure of the first laid eggs to hatch either by their being ruptured or rubbed or washed off. The following are the details of some of the experiments. The same results have been obtained repeatedly throughout the investigation wherever the nature of the experiments allowed of the data being obtained.

Burrow commenced	Larvæ first found	Burrows of second nymphs and males first found	Period in days elapsing between the commencement of the burrow and the finding of new burrows of second nymphs and males
February 4 ..	February 8 ..	February 11 ..	7
" 24 ..	March 2 ..	March 5 ..	11
March 5 ..	" 8 ..	" 11 ..	6
" 12 ..	" 17 ..	" 21 ..	9
April 15 ..	April 10 ..	April 12 ..	7
" 17 ..	" 21 ..	" 22 ..	6
May 2 ..	May 6 ..	May 8 ..	6
" 12 ..	" 15 ..	" 18 ..	6

In the above table it will be observed that the interval between the appearance of the larvæ and the appearance of the second nymphs varies from two to four days, which may be taken as the combined duration of the larval and first nymphal stages. Larval skins have, however been found in the burrows in several instances, and in some of these the first appearance of the larvæ has been noted. The interval between the first appearance of the larvæ and the finding of their skins being from one and a half to three days. This may be taken as representing the duration of the life of the larvæ, which leaves the short period of a few hours to two

and a half days for the duration of the first nymphal stage. The second nymphal stage represented by the interval between the first appearance of the second nymph, and its moulting varies, according to a series of observations from two to four days.

It is interesting to note that all the males appeared simultaneously with the second nymphs of the broods observed. This gives a period of from nine to fifteen days as the duration of the life cycle from egg to egg. No allowance has been made in the determination of the second nymphal stage for the effect on it of the absence of the males. If the change from second nymph to mature female is, as it may be, attendant on pairing and fertilization, an absence of males would delay it, and prolong the second nymphal stage. Unfortunately, it has not been possible to carry out experiments on that point.

Habits of the Male.

Males have been found only in the burrows of the second nymphs or in the branch burrows adjoining them. Gerlach (p. 90) states that the males make only short surface burrows, which are difficult to see and cause little or no irritation. Blanchard (p. 302) states that the male is usually found under the scales and scabs of the epidermis, but his statement almost certainly refers not to *var. hominis* but to *var. equi*. Dubreuilh and Beille, quoting Worms, state that the male is very active, only burrowing to find lodging and residing near the egg-laying burrows.

The males are difficult to find. Gerlach quotes Bourguignon as giving the proportion of males to females as one to ten and ventures the opinion that this proportion is low. The difficulty of finding the males may account for this low proportion. It is however fairly certain that the males are actually fewer in proportion to the females, that one male fertilizes several females, and that the male lives probably as long as the female.

Summary of the Life History.

The life cycle of the *S. scabiei* *var. hominis* occupies a period of nine to fifteen days.

Egg stage	..	..	..	lasts 2½ to 3½ days
Larval stage	..	..	..	lasts 1½ to 3 days
Nymphal stage	..	..	..	lasts 1½ to 2½ days
Second nymphal stage	..	..	..	lasts 2 to 4 days

The adult female lives certainly for at least three weeks and according to Gerlach and others four to five weeks. The male probably lives for a similar period.

The adult and the second nymphal stages make horizontal linear burrows in the upper epidermis. The larvæ bore more deeply either in the floor of the egg burrows or away from the burrows in the immediate neighbourhood of the hair follicles, and the irritation caused by their burrows gives rise to vesicles containing the serous fluid. The habits of the first nymph are not known and it has not been possible to study

them. Copulation probably takes place in the burrows made by the second nymphs, males having been observed in these burrows or in small branch burrows off them.

Egg laying is dependent on temperature and the hatching of the egg is dependent on temperature and humidity. It can be interrupted or delayed up to at least six days without destruction of the hatching power but development is proportionately slower.

Effects of Heat and Moisture on Acari and Ova.

A number of experiments on the effects of heat and moisture on acari and ova were carried out. The acari and ova were placed in a Nuttall's thermostat and observed through the microscope, as no other means of detecting death, or distinguishing "shamming" from death, is reliable except microscopical examination. The variation in humidity was determined by means of a twisted-fibre hygrometer, giving readings per cent. The humidity was raised by introducing moist filter paper into the thermostat and reduced by using calcium chloride. By these means a maximum humidity of eighty-two per cent and a minimum of twenty-six per cent were obtained, the temperature ranging from 25° to 55° C.

In vitro the following results were obtained, namely, that moderate humidity is as important for the wellbeing of the mite as moderate temperature. When the humidity was high (seventy per cent) the mites survived a temperature of 55° C. for more than half an hour. When the humidity was low (forty per cent) they survived the same temperature for from ten to fifteen minutes only. With a high humidity (seventy per cent) they survived a temperature of 40° C. for four hours, but with a low humidity were shrivelled in twenty minutes. Ova withstood drying better than the acari, resisting 55° C. dry (forty per cent humidity) for twenty to thirty minutes and 40° C. for four hours. With seventy per cent humidity they survived for half an hour at 55° C. and for twelve hours at 40° C.

Similar results were obtained with acari and ova placed in cotton and covered up in it, except that at moderate temperatures 30° to 40° C, they resisted dry conditions better. Acari resisted for thirty to forty minutes and in one case for an hour before becoming shrivelled. Ova withstood the dry conditions for twenty-four to thirty-six hours.

In these experiments death was determined by the shrivelling of the integument. In the first instance the attempt was made to revive the mites, but all failed, and the shrivelling of the skin was considered adequate proof of death. Movement was looked for, but no signs of it were ever manifested by the shrivelled or half shrivelled mites. Ova collapsed with drying, and although, in two instances, their turgidity was partly restored by moistening them, the contents of the egg became opaque and no development was observed. The collapse and opacity of the ova was accordingly accepted as proof of destruction and death.

DIAGNOSIS.

The chief points in the diagnosis of scabies are set forth in a memorandum on scabies issued by the War Office in 1918 as follows:—

Signs of scratching and irregularly scattered reddish papules on the chest, abdomen, and upper and lower extremities.

The presence of the burrows of the acarus on and between the fingers, on the front of the ulnar margin of the wrists, on the elbows and the front of the axillæ, on the penis, scrotum and buttocks and around the ankles.

The presence of small vesicles on the sites defined above.

Signs of Scratching and Papules.—These are the result of scratching on the part of the patient. They are however of clinical value as their distribution is peculiar, but they may be confused at first sight with the appearances found in other parasitic affections.

As Hebra (1868, page 211) has pointed out the situations, on which the scratch lesions produced by the patient occur, vary with the cause of irritation, and as the soldier may be infected with at least three external body parasites causing irritation, namely, *Pediculus humanus*, *Phthirus pubis* and *S. scabiei* it is desirable that the appearances produced by the respective affections should be recognized.

As regards *P. pubis* which is the least common of the three, Nuttall states (1918, page 395), that the parasite is usually confined to the pubis and perianal region. The scratching usually occurs on the trunks and limbs but the chief characteristic of Phthiriasis is the occurrence on the body of bluish spots. Nuttall (1918, page 377), describes them as pale bluish grey and states that they are most noticeable in skin regions that are sparsely haired, and usually disappear in about a week after the removal of the lice.

In pediculosis, Nuttall (1917, page 70), states that the presence of the insect is at once indicated by the reaction which usually takes place about the seat of the bite. The bite produces minute hæmorrhagic spots that are chiefly disseminated over the neck, back, and abdomen. He distinguishes pediculosis from scabies by the absence of lesions upon the hands and the wrists and by the presence of pigmented maculæ (melanodermia) which is most marked between the scapulæ.

MacCormac (1917, p. 144), relies on the fact that lice never attack the penis for distinguishing pediculosis from scabies which he finds are strikingly similar in their characters and otherwise very difficult to distinguish. Semon and Barber (1917, p. 179), give the following as the chief points in the differential diagnosis of the eruptions due to scabies and pediculosis.

Localization.

SCABIES.

Hands, wrists, elbows, anterior axillary folds, umbilicus and abdomen, lower triangular area, on the buttocks, penis and scrotum, front of knees and feet.

PEDICULOSIS.

Posterior axillary folds, shoulders, sacral region, and upper part of the buttocks, groins, thighs, and skin behind knees and ankles.

*Types of Lesion.***SCABIES.**

Burrows, vesicles, small superficial crusts, papules, pustules, and specific erection of the pilosebaceous follicles, with secondary eczematization, especially in seborrhœic cases. Scratches are represented by minute blood crusts at the apices of the erected follicles.

PEDICULOSIS.

Superficial and deep pustules with a surrounding red and indurated halo. Circular encrusted ulcers of varying size, but on the whole very much larger than those met with in scabies. "Linear impetigo."

They remark that while "linear impetigo" is not especially characteristic of pediculosis, the variety of the lesion which is pathognomonic of louse infection is a gutter shaped ulcer covered by a brownish crust and of considerable depth.

Burrows and Vesicles.—The burrows are produced by the active stages of the acarus but only those of the immature and mature females can be detected in a cursory examination. As stated above the burrows are situated on well defined sites the distribution of which is shown in fig. 5.

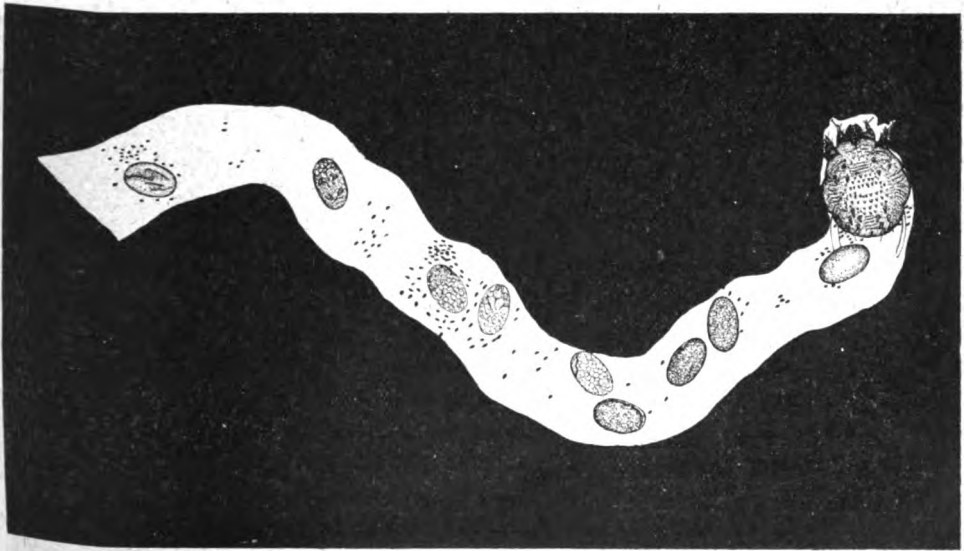


FIG. 5.—Burrow of *Sarcptes* showing acarus and eggs. Magnified. (J. W. M., del.)

They vary in length from two to five millimetres, and appear as fine, raised, more or less tortuous lines on the epidermis, not unlike the symbols used in shorthand. At the blind end of the burrow the acarus can be seen in a good light as an oval glistening spot at the anterior end of which a minute brown speck can be seen under the skin due to the colour of the rugose area and mouth parts and forelegs of the acarus. The burrows are entirely superficial as is shown by the fact that I have on more than one

occasion removed a complete burrow, roof and floor, acarus and eggs without drawing blood or producing a worse scar than a very slight abrasion.

The vesicles are small, about the size of a grain of barley. They are the result of irritation caused by the acarus secreting an acrid fluid, and while they invariably denote that an acarus is present in their neighbourhood they do not always indicate the precise position of the mite. They may occur either below a burrow or adjacent to it or, if caused by larvæ, they may occur some distance from the egg burrow. On their being opened a serous fluid exudes from them. They are often ruptured by the scratching of the patient, and, on healing, form minute crusts.

Itching.—Bourguignon (1850) and Hardy have proved by experiment that the intense irritation of the skin which occurs in scabies is due to the secretion of an acrid fluid by the acarus, the same which causes the vesicles to arise. It certainly is not due, as many authors assert, to the wandering of the larvæ or nymphs on the skin. I have repeatedly allowed larvæ and adult acari to crawl on various parts of my body and have never felt the slightest irritation. I have also asked some of my friends to repeat the experiment and they have confirmed this observation.

The irritation in scabies is most felt by the patient when he is warm and this is due to the fact that the acarus is then most active. That the mite is nocturnal in its habits, a statement common to many authors, is not in accordance with my experience which is that the mite is most active when its host is warm and resting, irrespective of the time of day or night.

In febrile conditions itching is generally abated and this often gives rise to the belief that the disease is cured.

Numerous instances have occurred in my experience in which patients suffering from scabies felt no itching. One in particular may be cited. On February 4, 1918, Second Lieutenant H., admitted to hospital for tonsillitis, was found to have scabies, burrows being found on both wrists. He must have had the disease for at least a week but felt no itching until he was informed that acari had been found on his person. Since then he felt it acutely. I have infected myself with the acarus and have had acari burrowing on my person for as long as three weeks without being conscious of their presence. Itching, moreover, may be due to many different causes and while it is always to be regarded as helpful in diagnosis, it is by no means an infallible sign of scabies. Three cases of phthiriasis have come under the writer's notice, all of which had been diagnosed scabies, because the patient had complained of itching.

Other Features of Scabies.—One feature of scabies which has only recently received attention is the appearance of the skin in the neighbourhood of the regions affected. It was first emphasized by Semon and Barber (1917, p. 175), who have found it especially valuable in the diagnosis of doubtful cases, and regard it as an almost constant phenomenon.

in scabies. This is the peculiar goose-like appearance of the cutis due to the erection of the pilosebaceous follicles, commonly called goose skin. My experience confirms the occurrence of this phenomenon but I have had difficulty in determining its extent, especially when patients are cold and shivering. Parkinson (1918), has also found it "a distinct feature of scabies."

Semon and Barber call attention to the danger of overlooking scabies in cases where seborrhœic dermatitis occurs, and especially where seborrhœic eczema of the face and scalp co-exists. They point out that in such cases facial eruptions do not preclude a diagnosis of scabies.

Method of Examining Patients.—In diagnosing scabies and especially in looking for acari, a good light is essential, together with a good pocket lens or handglass such as can be obtained from any optician. The writer uses a triple aplanat of wide field and brilliant definition, and finds that such a lens with a magnification of eight to ten diameters is sufficient for all general purposes.

The first step in looking for the acarus is to select a well defined burrow or vesicle. If a burrow is chosen, it should be traced with the lens along its whole length, when a slight glistening of the skin will be observed at the blind end with a small brown speck near it. These two appearances are due to the acarus, the brown speck being due to the colour of the mouth parts and epimeres. If now this end of the burrow be examined from different angles, the body of the acarus will be distinctly seen as a tiny oval elevation, the cause of the glistening, and if desired the acarus can be removed with an ordinary needle.

If a vesicle is chosen, the skin immediately around it should be carefully examined, when a faint burrow will be seen, at the end of which the acarus will be found. Sometimes, however, the acarus rests on the borders of the vesicle and the oval elevation, usually seen, may be indistinguishable. In this case the brown speck referred to above will locate the mite, which can then be extracted.

In the great majority of cases it is not necessary to remove the acarus for certain diagnosis, but it is advisable that medical officers in charge of scabies should learn to extract the mite, and so acquaint themselves with the varied appearance it presents in different burrows. On the wrists, particularly on the flexor regions, the burrows are usually long and the mites easily recognized. A thorough acquaintance with such burrows is a great help in detecting less conspicuous burrows and their contained mites on other regions.

The opinion has often been expressed, and Major MacCormac repeats it, that the acarus is difficult to find. He even asserts that the discovery of the acarus is useless when applied to the type of scabies met with in France, stating that the acarus is extraordinarily difficult to find even in well-marked untreated cases. At the same time he states that "discovery of the acarus is the only absolutely certain proof that a man is still uncured." As

previously stated, the writer has examined large numbers of scabies cases at a hospital receiving men from the Home Forces and from Overseas, and it is certain that these cases are representative of the type of scabies seen in France as well as at home. Now in every case sent in as scabies, and in many cases sent in as eczema, furunculosis and impetigo, the writer has obtained acari on quite a cursory examination. In fact many undetected scabies cases have been found by the method of examination described above, cases in which the ordinary lesions of scabies, on which MacCormac and others would rely, were completely masked by impetigo or dermatitis. The first essential in the diagnosis and treatment of scabies is a knowledge of the mite and its burrow, and it is absurd to assert as many do that medical officers have no time to spare for finding mites. A few hours daily, for two or three days, devoted to the careful examination of typical scabies cases, will suffice to enable the average observer to "spot" acari in their burrows and once the eye is accustomed to using a lens and detecting the acari, the diagnosis of scabies and the test for the cure of scabies is only a matter of minutes.

At the 1st Eastern General Hospital about fifty cases are examined in two to two and a half hours, and in every case the presence or absence of acari is determined and noted. The time required to examine a patient for acari is not great. Apart from the satisfaction derived from definite diagnosis, the discovery of the acarus has a most important bearing on treatment and cure.

In diagnosing scabies it is well to bear in mind the various types which occur. In simple scabies the diagnosis is usually easy as the burrows and vesicles are distinct. Where impetigo has intervened the typical scabies lesions are masked by the ecthyma, and in many cases the writer has found that the original scabies has been overlooked.

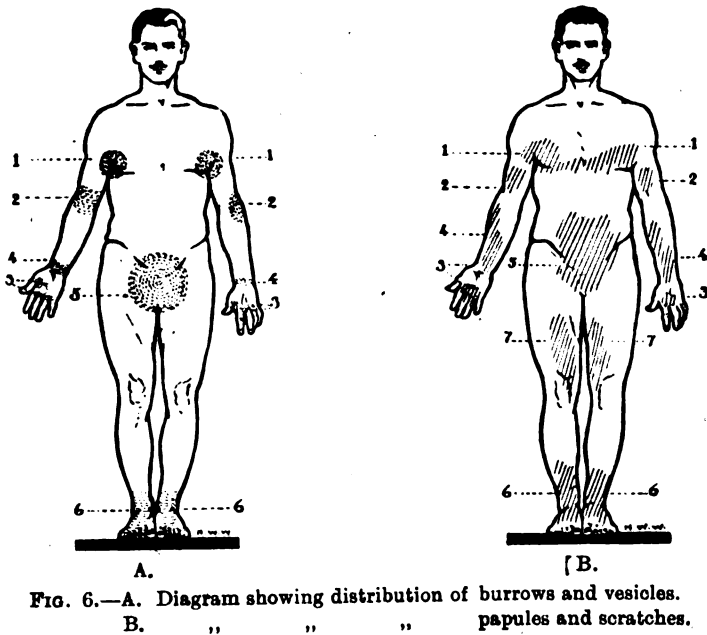
In scabies followed by impetigo, however, there are certain pathognomonic signs which point to the original disease. MacCormac has called attention to the impetiginized areas on the buttocks, elbows and knees, but here again, in the writer's experience, the discovery of the acarus is important in the majority of cases. Frequently the patient's own account of the onset of impetigo is helpful.

When sulphur dermatitis is present, complaints of itching have no value whatsoever, and in these cases the discovery of the acarus is absolutely essential for proper diagnosis. The same is true of scabies combined with pediculosis, for while the pediculosis may be diagnosed from the nature of the lesions the scabies is easily overlooked.

Routine Inspections.—In carrying out routine inspections of men for scabies, or of scabies patients under treatment, the following rules may prove useful:—

It is taken for granted that the men are stripped so that the abdomen, pubic region, thighs and buttocks can be examined; it is also understood that the inspection is being conducted in a well-lighted warm room or hut. Open air inspections for scabies are useless.

The first step is to pick out and segregate all men showing the lesions and eruptions already referred to as diagnostic. Those men whose skins are free from such appearances may be regarded as clean and dismissed. If by chance, slight cases are overlooked they will be detected at the next inspection. Having segregated the cases these can now be examined more closely and here the lens should be used. Brief notes should be made on each case, showing the localization of the lesions, and the resultant diagnosis. Where scabies is present particular care should be taken to note the sites on which the burrows occur as such notes are of great value during treatment. This method is by no means tedious. In the first place it eliminates all clean and unaffected men and if a slight case is now and then overlooked the consequences are not serious provided inspections are regularly carried out. It has also the advantage of allowing the medical officer to devote more care to the genuine cases.



In the writer's experience it has been found that as far as scabies is concerned the method is quite satisfactory. In the first place four definite diseases are looked for, impetigo, eczema, pediculosis (including phthiriasis), and scabies. An attempt is then made at differential diagnosis, followed by a final examination for acari.

In actual practice it has been found that the diagnosis of scabies depends almost wholly on three factors; the occurrence of: (1) burrows and (2) acari on the wrists or on the penis, and (3) of ecthymatous impetigo on the buttocks. In the great majority of cases at the 1st Eastern

General Hospital these three appearances constitute the diagnosis of scabies.

The accompanying diagrams (figs. 6A and 6B) illustrate the distribution of burrows and vesicles and of the corresponding papular eruption. It is suggested that in scabies treatment centres, whether military or civil, the use of such diagrams will greatly simplify diagnosis and treatment. In using the diagrams the medical officer indicates by a stroke of the pen the regions affected and so obtains a record of the man's condition. If desired the papular eruption can be recorded in the same manner.

ETIOLOGY.

The etiology of scabies as described in the literature is somewhat obscure. Hebra who treated some thousands of cases states that he found disinfection of clothing and blankets unnecessary and implies that the disease is rarely spread by fomites. Gerlach refers to Gudden's experiments, in which several cured scabies patients returned to their old undisinfected beds and showed no recurrence of the disease. Other authors as Blanchard, Railliet and Guiart express the opinion that continued body contact is essential for the spread of the disease although they suggest disinfection of fomites. MacCormac and others more recently (1917) state that all the evidence points to blankets as the source of infection and the cause of spread in the Army. Professor Darier (1917) is of the opinion that the disease is largely venereal in origin.

Personal Experiments and Observations.—I have carried out a series of experiments to test the infectivity of blankets, clothing and other probable fomites. In the first instance a number of preliminary experiments were made on the transference of individual mites from the person of infected soldiers to that of the writer. Adult female acari were removed from their burrows on the soldier's skin and transferred to my own wrist. To prevent their wandering they were confined in a cell as described in methods (see p. 14). The following were the results obtained:—

The acarus can readily be transferred from its burrow in the skin of an infested person, and, on being placed on a new host, will burrow in and recommence egg laying. This was shown by one of the experiments in which four female mites were allowed to establish themselves on my left wrist, which was washed very carefully to avoid destroying burrows or vesicles. The mites burrowed in on February 24. Three of them established themselves, and by March 11 had given rise to five new burrows. I then ceased to wash the region carefully and by March 15, the burrows were rubbed off and no mites were to be found. On March 21, however, burrows appeared on the fourth finger of the left hand and on the right wrist.

Other experiments indicate that ordinary cleanliness is quite enough to prevent chance contagion obtaining a hold. In three experiments the

mites failed to establish themselves but in a fourth, where I deliberately refrained from washing the affected part, they succeeded in obtaining a hold and the infection spread in the region affected.

Experiments with Clothing and Blankets.—The first experiments were conducted at the 1st Eastern General Hospital, Cambridge, and the later ones at the Cambridge Research Hospital. In these experiments every precaution was taken to prevent chance infection and at the 1st Eastern General Hospital, a corporal and two men served as controls. At the Research Hospital controls were not always available. The subjects of the experiments were civilians who volunteered for the purpose and received board and lodging and a weekly sum in remuneration. Owing to the limited number of volunteers available and the necessity of curing them for succeeding experiments, and allowing a minimum period of fourteen days to elapse after cure to insure its certainty, the experiments are limited in number and scope, and it is hoped that further experiments on a large scale may be made on these lines. The impossibility of obtaining volunteers among the soldiers has been a serious drawback. On the other hand the writer is indebted to Colonel Griffiths, officer commanding 1st Eastern General Hospital, and to Major Wright, medical officer in charge of skin diseases at the hospital, for the facilities freely given and for permission to delay treatment in certain cases subject to the approval of the men themselves. This last concession made many experiments possible which otherwise could not have been carried out.

The first series of experiments were conducted to test the infectivity of blankets and clothing. They were carried out in a small hut having six beds. In two of these a corporal and an orderly slept and unconsciously served as controls. The other four beds were occupied by two heavily infested soldiers and two volunteers respectively. At the commencement of the experiment beds "A" and "B" were occupied by the volunteers. On the second night of the experiment the soldiers and the civilians changed beds and this changing nightly was continued throughout the experiment. Each soldier slept only two nights in the hut, passing out for treatment on the second morning and being replaced by fresh arrivals.

In the first four experiments with the blankets no infection was obtained, but a volunteer who slept in the blankets of a heavily infected Royal Flying Corps private on May 11, showed two burrows on his wrist on May 20 and on May 22 was seen to be generally infected. Infection from blankets was also obtained in another experiment, acari being found on the volunteer twelve days after he slept in the infected bed.

Experiments with clothing of infected soldiers gave results almost at once, infection being obtained in from three to five days. Shirts and pants were the articles selected. Gloves also gave early results. All these experiments were conducted on the assumption that acari occurred in or on clothing. Two experiments were made with clean gloves on which eggs and mites removed from burrows were respectively placed. These also

gave positive results. The egg infected gloves produced itching in six days and in seventeen days burrows were found on the wrist of the volunteer. The mite-infected gloves caused a burrow to appear in six days.

In these experiments the clothing was transferred directly from the infected man to the volunteer.

A further series of experiments were conducted to test the duration of the period in which the blankets and clothing remained infected. The experiments with blankets gave no results, but clothing removed from an infected volunteer and allowed to lie on the floor of the hut exposed to ordinary atmospheric conditions for varying periods produced infection after six and eleven days exposure respectively. It is probable that this period does not represent the limit of the infectivity of clothing. Gerlach, page 65, estimates that bedding containing the eggs may be infective for fourteen days, and his suggestion that egg infected clothing only is capable of remaining infective after two or three days is probably correct. It is certain that a fair amount of moisture is absolutely essential for the life of the mites and ova and that this factor is as important as temperature.

Experiments on Infection by Contact.—It has not been thought necessary to conduct experiments on infection by prolonged body contact on the part of an infected and non-infected person.

On two occasions I have reason to believe that I myself contracted scabies while examining infected cases, and instances occur here and there in the literature of scabies where doctors have contracted the disease from their patients. Abundant evidence has been obtained of soldiers infecting their wives and children, and it is obvious that infection by contact is the most usual mode of spread of scabies.

Professor Darier's opinion that the disease is largely venereal in origin is to a certain degree true in so far that the term "venereal in origin" implies intimate and prolonged contact. On the other hand, close and prolonged contact, as when two men or a mother and children sleep together, is equally favourable to the spread of the disease, and equally important. In this connexion it is interesting to note that at Cherry Hinton Military Hospital the percentage of cases of gonorrhœa combined with scabies, and syphilis combined with scabies, is only 3·5, as I am informed by the officer in command of the hospital, Major Gibson. So low a percentage, if an average one, seems to me to indicate that Professor Darier's term "venereal" must not be accepted too literally.

Scabies produced by the Itch Mites of Domestic Animals.—As has been stated on p. 3 several varieties of *S. scabiei* which normally occur in domestic animals may give rise to a form of scabies in man. I have obtained no evidence relating to the occurrence of such forms of scabies in the Army, but I have recently examined three grooms (civilians) who contracted itch while attending horses suffering from mange (*S. scabiei* var. *equi* Mégnin), and have obtained acari from one of them. So far, however,

I have been unable to determine whether the acari obtained from the groom are var. *equi*, and the whole question, which is being investigated, will, it is hoped, be dealt with in a later paper.

Summary.—Scabies is due to the presence in the skin of the mite *S. scabiei* var. *hominis*. The mite is conveyed from person to person by body contact, by blankets and clothing. The clothing of persons suffering from scabies may remain infective for at least eleven days.

A form of scabies may be contracted from certain domestic animals suffering from mange, of which the horse is probably the most important.

TREATMENT.

Scabies being due to the presence in the skin of the itch mite, cure can only be effected by removing or destroying the acarus.

This may be achieved in two ways, either by removing and killing the acarus mechanically or by destroying it in its burrow by means of an acaricide. In actual practice a combination of the two methods is usually adopted, consisting of a mechanical preparatory treatment followed by treatment with an acaricide.

Mechanical Preparatory Treatment.—This part of the treatment has for its aim the rupturing of the burrows and consequent removal of the acari and eggs, or exposure of them to the acaricide, and is carried out as follows:—

The patient enters a bath containing sufficient water at 100° to 106° F. to cover him when lying in it, and thoroughly soaks himself for twenty minutes. He is then rubbed all over with soft soap for five to ten minutes. Re-entering the bath he is scrubbed thoroughly with a hard nail brush to unroof the burrows and displace acari. Between the toes and fingers a toothbrush is used. A shower bath completes the process, and the patient, after being thoroughly dried with a rough towel, is ready for the application of the acaricide.

The success of this part of the treatment depends on several factors, and is only ensured if:—

- (1) All the usual sites of the lesions, as described on pp. 31 and 32, are thoroughly scrubbed, whether obviously affected or not.

- (2) The orderly carrying out the treatment understands his work, and is interested in obtaining cure.

- (3) The patient has had the principles of the treatment explained to him, so that he assists, or even encourages, the orderly in his work.

If all these conditions hold good, the patient, on examination after this treatment, should show all the burrows and vesicles ruptured and destroyed. If either vesicles or burrows are present, the treatment must be repeated. It is in testing the efficiency of the mechanical treatment that a knowledge of how to find the acarus is most useful. If on the first examination and diagnosis of the case the sites of the burrows and vesicles have been noted, these can readily be examined, and if all the burrows and vesicles are

ruptured, and all acari are gone, no further treatment is necessary, although one more may be given as a factor of safety.

Treatment with the Acaricide.—This part of the treatment ought to be regarded chiefly as a safeguard against inefficiency in the mechanical part, dealt with above, the object of it being to destroy any acari which may have escaped destruction or removal, and more especially to kill any larvæ which may hatch from ova which have escaped destruction.

The Choice of an Acaricide.—The choice of an acaricide is governed by three considerations; it must kill the acarus; must not injure nor irritate the human skin, and it must be cheap and easily procured. There are many substances which fulfil the first condition. Neumann (1905, p. 126) gives a list of twenty-four of them, and Hebra (1868, p. 236) states that the ointments used in the treatment of scabies are legion. Practically, the choice of an acaricide if limited to three substances—sulphur ointment, lime and sulphur lotion (Vleminex's solution or liquor calcis sulphuratæ), and balsam of Peru. Balsam of Peru is more costly than the sulphur preparations, but it is a mild and effective ointment, and is especially suitable for children and women with tender skins and for private practice.

In the Army, the acaricides used are sulphur ointment and liquor calcis sulphuratæ. These have the advantage of cheapness and, in the writer's opinion, it is doubtful whether any other preparations can be obtained which are so cheap, so easily procured, and so efficient if properly used.

The War Office memo. on scabies (1918) gives the preference to liquor calcis sulphuratæ (British Pharmaceutical Codex Formula). Its advantages are that, unlike an ointment, it does not require rubbing in; that it temporarily stains the skin and enables the medical officer to detect any portions of the skin which have been passed over. Its use has recently become more general, and Colonel Gray, one of the Consulting Dermatologists to the Army in France, has found that it gives most excellent results in so-called impetigo (ecthyma) complications. His experience of it shows that it dries up the ecthymatous lesions, and in some cases even renders further treatment for the ecthyma unnecessary.

Treatment with Sulphur Ointment.—The most suitable sulphur ointment is ung. sulphuris, 1 in 15. This is weaker than the British Pharmacopœia ointment, which is 1 in 10, and is too strong. Its application is described in the War Office memo. of 1918 as follows:—

(4) The preparatory treatment having been carried out, the neck, body, and limbs are to be very thoroughly rubbed with the ointment, a trained orderly thoroughly massaging the ointment into the skin; special attention should be given to the parts usually affected (see page 31).

Precautions: (1) Not more than two ounces, to be used at one time.

(2) The rubbing is to be done thoroughly, but not continued after all the ointment is absorbed by the skin, which takes about twenty minutes' rubbing.

(3) The ointment must be kept in a covered container, the lid if laid down being placed on a clean plate.

(4) The portion must be served with a clean spatula on to a clean paper on a shelf at hand.

(5) The spatula must be laid on a clean plate and not on the shelf or container lid.

(B) The bath and treatment are to be repeated in all details on the second and third days.

Treatment with Liquor Calcis Sulphuratæ.—(1) The mechanical part of the treatment having been carried out from three to five ounces of the liquid (depending on the size of the man) are placed in a clean saucer or basin for each patient. A trained orderly wearing rubber gloves dips a six-inch square of clean lint in the liquid and rubs this all over the body, extra and first attention being given to the special parts mentioned before. The liquid must not be allowed to run on to the glans penis. (This should be treated with ointment.) The rubbing ought to be done, if possible, near a fire or stove, and the liquid should be allowed to dry in, no towel being used.

Precautions : If an enamelled iron vessel is used it must have no exposed metal.

Any portion of the unused liquid must be thrown away, and the vessel washed for the next case.

The stock bottle should not be larger than twenty ounces, and must never be left with the stopper out, as the liquid rapidly deteriorates on exposure to the air.

The lint after use must be destroyed and a fresh piece taken for each case.

If the patient's skin is very sensitive it may be desirable at the first application to dilute the liquor with an equal part of hot water. As after the treatment with liquor calcis sulphuratæ the skin is yellow in colour, it is easy to see at a glance whether the liquor has been applied conscientiously; the depth of the colour, which should be uniform on all parts, will indicate the thoroughness of the application. When the skin is dry the patient should dress in clean or disinfected clothing.

(2) The bath and treatment are repeated in all details the next day.

Two thorough applications of the undiluted liquor on each of two successive days are usually sufficient to destroy the parasites.

General Remarks on Treatment.—The most usual fault in the treatment of scabies is that the secondary lesions are considered more important than the actual cause. The writer has on several occasions seen time and trouble spent on the "curing" of the papular eruption, and, in one instance, he examined eight patients, supposed cured, all of whom showed burrows containing acari. The papular eruption had to a large extent disappeared, but the acariasis still remained. Another common fault is over-treatment with parasiticide. This may be due to the use of too strong an acaricide or to too frequent application of a weak one. The result is the same in both cases—sulphur dermatitis. The regions most affected are the front

of the forearm and upper thighs. This is due to the fact that the papular eruptions are common on these parts, and both the orderly and the patient are apt to rub in the ointment or apply the liquid rather freely on them. Further, where ointment is used, these parts of the body, which are most easily rubbed, almost invariably get an undue share of attention. Semon and Barber have called attention to the susceptibility of seborrhœic subjects to sulphur dermatitis.

Sulphur dermatitis is one of the chief causes of delay in scabies treatment and it is unfortunate that the patients themselves seem to realize this and deliberately use excess of ointment, either gaining access to the hospital supply or buying ointment outside. Where the ointment supply is within reach of the patients, they use it on the first inclination to scratch, and it is absolutely essential that this should be prevented. Malingering in scabies patients is frequent, especially if the medical officer lacks faith in his methods of treatment, and the common practice of relying on a patient's complaint of itching or of scratch lesions as indicating that cure has not been affected is playing into the hands of the malingerer.

It cannot be too strongly emphasized that if, after the normal course of treatment has been given, the usual infected sites on the skin are free from vesicles and burrows and acari, the patient is to be considered cured, and that further complaints of itching are to be attributed to the effects of treatment or to the effects of the acariasis which will ultimately disappear.

Where complications occur, the treatment may have to be modified but as MacCormac has pointed out, impetigo in no way contra-indicates the use of sulphur and pediculosis certainly does not. Dermatitis, on the other hand, to which seborrhœic subjects are especially liable, is a troublesome complication and often entails modification or interruption of the scabies treatment. Where, however, complications exist, the scabies, should, if possible, be treated first and, as soon as the acari are found to have been destroyed, the diagnosis of the case should be altered to that of impetigo or such other pyodermic infection as may be present and the case transferred to another ward.

Treatment Centres.—For the proper treatment of scabies, as for pediculosis it is absolutely essential that properly equipped treatment huts or centres should be established. The cure and treatment depends on careful diagnosis, and careful mechanical and parasiticial measures. These measures require for their execution a trained medical officer, with a permanent trained staff. Regimental treatment may give the results claimed for it but it is very doubtful. The Regimental Medical Officer has too much to do as it is, and it is not to be expected that he will have time and means at his disposal for the carrying out of the measures indicated above.

The scabies problem is in every respect akin to the louse problem, and scabies and pediculosis require almost precisely similar remedial control measures. Nuttall in his exhaustive work on "Combating Lousiness"

(1918) has discussed fully the various preventive and remedial measures against pediculosis, and these, with modifications, apply equally against scabies, except for the measures relating to personal cleanliness. The *acarus* is more easily destroyed on clothing, etc., than the louse, but it is less easily eradicated from the person. This entails more complex inspection and bathing facilities than are required for lousing. A suitable scabies disinfection establishment consists of two huts placed side by side and supplied with an adjacent disinfector. The first hut is the inspection and bathing establishment and the second is a scabies and skin ward.

The inspection and bathing hut consists of six apartments, a waiting room, an undressing room, an inspection room, a bath and treatment room, and a dressing room. The undressing and dressing rooms communicate on the one hand with the disinfector and on the other with the ward. Patients enter the waiting room, pass on to the undressing room as required and there remove all articles of clothing, and personal effects, which are taken to the disinfector. They then pass into the inspection room, where they are examined by the medical officer and an N.C.O. Here notes are made as to the distribution of burrows and vesicles and the presence of complications, and the treatment is prescribed in detail. The patient then passes on for treatment.

The Treatment Hut.—The chief essential of the treatment hut is that the various stages of treatment should be separated. The patient enters at one end of the hut and leaves at the other; he never returns to any compartment. This is necessary to ensure proper disinfection. The waiting, or reception, room calls for no special description, consisting of a simple room provided with benches and warmed by a central slow combustion stove. The remainder of the hut is provided with a concrete floor sloping across the hut with a fall of six inches. This floor drains to a gully or runnel on the right-hand side of the hut. The walls separating the compartments do not reach the floor but are raised nine inches above it. Neither do they reach the ceiling or roof of the hut. This arrangement allows for the heating of the whole hut by the heat given off from the boiler in the treatment room, and, also, for the thorough sluicing or flushing of the whole floor by means of hose pipes. The whole of the upper half of the left wall of the building is of glass, consisting of a series of windows, and the left slope of the roof is furnished with skylights. This gives plenty of light, which is an absolute essential in the scabies treatment. The undressing room is supplied with numbered shelves for the soldier's personal property and with numbered pegs for his clothing and equipment. A set of lower shelves, also numbered, holds their boots. The inspection room is supplied with two chairs and a table, and has a door opening to the outside for the use of the medical officer and staff.

The Bath Room and Treatment Room.—This consists of three sections. The first consists of a series of baths three feet apart arranged in two rows and varying in number according to the accommodation available, or, in

permanent depot establishments, to the number of patients ordinarily requiring treatment. The baths are well lighted, and each is supplied with a shelf or a locker for nail brushes, soap, towels, etc., and with a grid. The passage between the rows of baths should be three feet wide, so that patients do not come in contact with one another in passing. If desired, one side of the bath section of the hut can be reserved for impetigo or ecthyma cases.

The second part of the hut comprises the shower baths, which are arranged side by side. There should be one shower for every two or three baths. Adjoining the showers are the latrine and urinal. The latrine should be of the "Indian type." The showers occupy one side of the upper portion of the treatment hut, the remaining space forming the parasitocidal treatment section. This should be well lighted and furnished with glass shelves on which the lint and parasiticide is kept.

DISINFESTATION.

Acari and ova placed in small glass tubes, which were wrapped in clothing and then placed in a steam hut (Grant's) at the 1st Eastern General Hospital, Cambridge, were destroyed by twenty-five minutes' exposure to the working temperature of the hut (65° C.). This result, together with the experiments on the effects of heat and moisture on acari and ova, described on page 25, show that the disinfection of *Scabies fomites* can be carried out by the dry and moist heat methods recommended for louse destruction (see Nuttall, 1918, p. 435 *et seq.*, and Peacock, 1917).

THE CONTROL OF SCABIES.

The control of scabies depends on:—

- (1) Accurate and early diagnosis of the disease.
 - (2) Careful mechanical and acaricidal treatment.
 - (3) Adequate disinfection of clothing and bedding of infected persons.
- Personal cleanliness goes far to prevent the spread of the disease.

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THE CASUALTY CLEARING STATION AS A WORKING UNIT IN THE FIELD.

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THE casualty clearing station having come into existence as a working unit for the first time during the present war, some account of its inner organization may be of interest to those who have not been intimately connected with it.

"R.A.M.C. Training," 1911, tells us that "A Clearing Hospital," as it was called prior to 1915, "is a unit which is specially set apart for the evacuation of the sick and wounded collected by the Field Ambulances," and that it "only acts as a hospital, in the usual sense of the term, during the time it is unable to pass its patients down to L. of C." Since the above was laid down, however, the "clearing hospital" has not only changed its name but has considerably developed its functions. The word "hospital" has dropped out of the title, but its function as a hospital has developed far beyond what was probably originally intended. A recent memorandum issued by the Quartermaster-General lays down the following as the functions of a Casualty Clearing Station:—

- (1) To provide hospital accommodation, nursing, and treatment for patients unfit for further transport; i.e., the hospital section.
- (2) To provide temporary surgical treatment, shelter, and food for patients, pending transfer to the base; i.e., the evacuation section.
- (3) To retain slighter cases of sickness and wounds, pending return to duty or transfer to rest stations; the convalescent section.

The relative numbers dealt with under heads (2) and (3) will vary considerably during active operations as compared with quiet intervals. In quiet times the clearing station is, for obvious reasons, able to keep its patients for a much longer period than during active operations, and its functions, in the former case, approach more nearly those of a stationary hospital.

Success in the working of a clearing station depends on certain methods being carefully worked out and laid down, and smoothness and rapidity in the carrying out of these methods. The staff needs special and careful training, everyone must understand his particular duties, and know exactly what is required of him; it is all-important, therefore, that the staff should be at all times trained in the methods and routine which it is intended to follow during the rush and stress of active operations. The various orders should be as clear and concise as possible, avoiding ambiguity, and at the same time leaving little to the imagination.

Before considering the methods for dealing with a large number of

casualties, it may be well to discuss the various points which need to be attended to by way of preparation.

(1) *Training of Reinforcements.*—The permanent staff of the clearing station will be reinforced under arrangements made by the D.M.S. These reinforcements will include officers, sisters, N.C.O.s, orderlies, and stretcher-bearers.

It is difficult to lay down a hard and fast rule as to the numbers of reinforcements required, but taking as a standard that the military operations are going to continue over forty-eight hours and that three operating tables are to be kept going continuously, the numbers shown in Appendix I have been found to be approximately what are required.

On arrival, these reinforcements should be specially instructed in the duties they will be called upon to perform. Officers should be attached to permanent officers of the unit, according to the work which they will have to carry out; surgeons to the surgical specialist or second surgeon, anæsthetists to the anæsthetist, and general duty officers to officers in charge of wards, so that all may become familiar with the particular methods in vogue and which may vary in certain details from those to which visiting officers have hitherto been accustomed. This refers of course to details of organization, not to professional technique. Similarly sisters should be instructed by the sister-in-charge, theatre-sister, and ward-sisters respectively. N.C.O.s and orderlies should be posted to the wards and various departments in which it is intended that they shall work; and stretcher-bearers should be instructed and practised in their duties by a competent N.C.O.

(2) *Equipment and Supplies.*—All equipment and supplies should be checked and inspected, and any shortage made good; this will include medical and surgical equipment, dressings, drugs, sera, rations, medical comforts, blankets, stretchers, trestles, etc.

In addition, it will be necessary to see that lighting arrangements in the wards, theatre, receiving rooms, etc., are in good working order; that necessary arrangements are made for the storage of water where required, that cooking arrangements are adequate for largely increased numbers, and that there is a plentiful supply of clothing.

(3) *Day and Night Staff.*—The staff of every department should be divided into day and night parties in order that the work may go on uninterruptedly throughout the twenty-four hours.

(4) *Extra Accommodation for Personnel.*—Accommodation must be arranged for the extra personnel. It is important to arrange if possible that all night-duty personnel have separate sleeping accommodation, so that their rest during the day shall not be disturbed.

(5) *Equipping of Wards.*—Each ward must be equipped so as to take patients up to its utmost capacity, and for this purpose everything in the way of tables, chairs, flower-stands, etc., not actually required, should be removed.

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(6) *Allotment of Cases to Wards.*—It is well to decide upon a definite scheme laying down the class of cases which each ward is destined to take. A copy of this scheme should be posted in each receiving room and all officers and N.C.O.s should be acquainted with it.

(7) *Preparation of Receiving Rooms.*—Separate receiving rooms must be available for lying cases and for walking cases. Each receiving room should have a dressing room attached.

The lying case receiving room should be as clear of furniture as possible, all available floor space being reserved for stretchers as they are brought in. The room should be capable of holding at least 100 stretcher-cases, allowing for an interval of one foot between stretchers. Palliasses should be arranged on the floor so that stretchers can be placed on top of them.

An oxygen-cylinder with tube and face-mask attached should always be close at hand, lives have been saved by taking this precaution; some urine bottles, bed-pans, and basins for vomiting into should also be at hand.

The dressing room attached to the lying case receiving room should be fitted up with at least four pairs of high trestles, arranged in such a way that stretchers can be easily placed on them and removed again without disturbing the trestles, and there should be an overhead light over each.

The walking case dressing room and receiving room should be fitted up with forms or chairs arranged in rows, so that all patients can be easily and quickly seen, inspected, and fed.

This receiving room should have sitting accommodation for 100. Each dressing room should have an ample supply of dressings, ready sterilized, a reserve stock being at hand in sealed tins, bandages of all kinds, anti-tetanic serum, splints, and a few necessary instruments. Some arrangements for heating water should be in each room or close outside. In the walking case receiving room there should be some improvised foot-rests. A glue pot is useful for securing the ends of bandages.

An important point is the taking of each patient's particulars on arrival. A number of N.C.O.s should be trained in this beforehand; care and rapidity is essential. Convalescent N.C.O. patients are useful for this work. The small slips, Army Form W. 3210 are difficult to handle and write on unless fixed in some way. A convenient and simple method is described in Appendix II.

To pass on now to the actual method of dealing with casualties as they arrive: Ambulance cars will probably arrive in rapid succession, and it is most important that congestion be avoided. Cars should have a clear run to the entrances to the receiving rooms and a clear run out of the grounds by a separate exit. Cars which bring lying cases have to pick up blankets, stretchers, Thomas' splints, &c., in exchange for those they bring in, and these should be stacked in a convenient position on the way out, with an attendant in charge to hand them over. A party of stretcher-bearers, under an N.C.O., should be on duty at the entrance to the lying case receiving

room, for the off-loading of cars, and a tent or shelter should be available close at hand in which to place arms and equipment prior to removal to the pack-store.

An N.C.O. should be detailed to keep count of the numbers of cases which arrive; this is necessary when each clearing station of a group is ordered to take a fixed number and then to cease receiving until its turn comes round again.

On arrival in the receiving room all cases should be seen by an officer. When cases are arriving in numbers, this officer makes a rapid inspection of each batch before attempting to look at their cards or to ascertain the nature of their wounds. Cases occasionally arrive in so collapsed a condition that their rapid removal to a ward for anti-shock treatment is essential, and every moment is of importance. The practised eye quickly detects such cases; there is no mistaking the drawn grey face of the "shocked" man. Such cases should be removed to a special ward without a moment's delay, so that they may receive suitable treatment and made warm by the various means at disposal, such as hot bottles, electric light cradles, etc. A clerk should accompany the patient to the ward and take his particulars there.

The officer in the receiving room will then see each case in turn, rapidly ascertain the nature of his wounds or disability, mark him for a ward, dressing room, or pre-operation ward, as the case may be, and order his removal as soon as his particulars have been taken.

As each case is marked for a ward, the number of the ward should be called out and scored down on the "spare bed board" against the ward in question; by this means it is known when any particular ward becomes full. Each receiving room should have a "spare bed board" on which the number of spare beds in each ward is written up at a fixed hour each morning, and again after each evacuation.

The officers dealing with cases in the receiving rooms should know thoroughly the scheme laid down for allotment of particular cases to the various wards, so that there shall be as little as possible delay in getting cases away, and so keep the receiving rooms as clear as possible. These officers have to decide rapidly which cases require operation, which cases can be dressed without an anæsthetic, and which cases require no immediate interference.

Cases which will require a general anæsthetic should be labelled "theatre," and removed to the "pre-operation ward." Cases which require dressing, not demanding a general anæsthetic, should be labelled "dressing room," and put on one side ready to be dealt with, and cases not requiring dressing should be marked for a ward and removed.

For this labelling a supply of labels should be kept ready written out, with a loop of string attached, to slip over the handle of the stretcher. As regards the working of the dressing rooms—at least one officer, one or two sisters, and two orderlies should be on duty in each room. The dressing

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being done by the sisters and orderlies under the supervision of the officer. The main principles to aim at will be removal of dressings, cutting away clothing if necessary, cleansing of wounds, removal of foreign particles, and applying fresh dressings. The patient is then ready for evacuation.

Should it be found in the dressing room that the wounds of any particular patient are more serious than was at first thought, and that he will require operation under an anæsthetic, he is converted into a "theatre" case, and labelled accordingly.

It should be a rule in the clearing station that no case is evacuated further until his dressings have been changed and all his wounds examined.

As regards the feeding of patients on arrival, experience has shown that it is wise to have a standing order that no lying case is to be given anything to eat or drink until ordered by a medical officer; this obviates the possibility of patients suffering from abdominal wounds, etc., receiving food. Walking cases should be given some food as soon as possible after arrival; hot cocoa and bread and butter usually suffice; one of the pleasing aspects of an otherwise harrowing scene is the sight of these tired and hungry men, who probably started out to fight at dawn, enjoying their well-earned meal.

The classification of patients, with a view to their ultimate disposal and a ready means of recognizing such classification, is a point worth considering, and it is as well to arrange some simple method of effecting this. A method which has been found simple and satisfactory is described in Appendix III.

The method described has been found simple and effective, and all ranks quickly learn what the various colours indicate. As soon as a medical officer has decided on the disposal of a patient, he attaches a coloured label to the bed-rail or stretcher-handle in the case of lying patients, and to the breast pocket button in the case of walking patients.

A supply of these labels of each colour should be kept in each ward, in the receiving rooms and the theatre.

It might be well if a scheme of classification, such as that described, were made universal throughout the Expeditionary Forces; this would obviate difficulty and confusion which necessarily occur when medical personnel is moved at short notice from one unit to another.

Special arrangements require to be made in order to deal with a large number of gassed patients. It is essential to have one officer and a number of orderlies specially trained and practised in the administration of oxygen to a number of cases simultaneously. •

Appliances for giving oxygen to six or seven cases at a time from one cylinder should be improvised, and the "gas party" instructed in their use.

As regards the distribution of cases to wards, it is well to decide beforehand as to the class of cases each ward is to take, the main points being to avoid the intermingling of purely medical with surgical cases, severe cases with slight cases, and so on. The details of such arrangements

will depend to a great extent on the number and size of the wards, and on other local factors. It is advisable, if possible, to keep perforating wounds of the chest, wounds of the abdomen, and head wounds involving injury to the brain, in special separate accommodation.

Some accommodation will, of course, have to be reserved for infectious disease cases and mental cases.

To consider now a few of the salient points regarding organization in the wards: Each ward will have its officer-in-charge, sister, and orderlies—the latter consisting of nursing orderlies and general-duty men, the number depending on the size of the ward and the establishment available. Two hundred bedsteads are now authorized for a clearing station, and these will naturally be used in the most serious wards—for the rest, stretchers on trestles, covered with either blankets, straw or paper-filled palliasses, or mattresses, form very efficient beds. These beds and stretchers should be arranged head to the wall, leaving the centre passage quite clear; if a table is needed in the ward, it can be placed end on to the wall, taking the place of a bed or stretcher, and not allowed to block the centre-way. This is an important point in view of the more or less constant in-and-out traffic of stretchers and bearers. Each ward should, if possible, have at least two bunks, one to serve as a pantry, and the other, at the opposite end, to serve as lavatory where bed-pans, urine-bottles, etc., are kept. It is as well to have a third bunk for the use of the sister of the ward, in which charts, clinical thermometers, record books, etc., are kept.

In each ward taking surgical cases there should be a wheeled trolley for dressings.

Pre-operation Ward.—Into this ward will be brought all cases which require, and are in a fit condition for operation. It should be conveniently near the theatre and should be capable of taking from thirty to forty patients. It should contain only bare necessities; mattresses or palliasses should be arranged on the floor so that the stretchers can be placed readily on them without disturbing their arrangement. A shocked or severely wounded man is much more likely to rally if his stretcher is placed on a mattress on the floor; an air-space under him should be avoided. Care should be taken to have these mattresses so arranged that the stretcher-bearer at the head can pass between the mattress and the wall, without being tripped up. The ward must be kept very warm. The work in this ward will be mainly the preliminary preparation of patients before removal to the theatre, their clothing will be removed and warm pyjama suits put on, they must be made as warm and comfortable as possible, and the comfort should be mental as well as physical. Every effort should be made to soothe and quieten them before the ordeal of going to the theatre; if they will sleep so much the better. A sister should be in constant attendance in this ward, as well as well-trained orderlies. Careful watch must be kept for any sign of the condition of a patient becoming worse, so that a surgeon may be summoned to decide whether it is advisable to defer

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operation. This obviates the risk of a patient being taken to the theatre and then found to be unfit to undergo an operation. The surgeons should visit the pre-operation ward at intervals in turn, inspect the patients there, and select them for operation in order of urgency.

Resuscitation Ward.—A special ward should be set aside for the resuscitation of "shocked" patients, that is, those patients who are suffering so severely from surgical or "wound" shock as to be unfit to undergo operation until they have rallied. Special arrangements must be made in this ward for the rapid "Rechauffement" of these cases, as well as other anti-shock measures, such as saline infusion apparatus, etc. This ward should be capable of taking from forty to fifty patients.

Moribund Ward.—Another ward should be available for cases which are obviously beyond hope of recovery, and are in a dying condition.

Operating Theatre.—We come now to this, the most important part of a casualty clearing station. One may venture to say that more lives are saved in the theatres of casualty clearing stations than anywhere else in the chain of evacuation.

Several different patterns of theatre may be seen in the various clearing stations, it is however probably generally agreed that the best pattern is a long shaped hut or room capable of taking eight to twelve tables in a row, with one or two anæsthetizing rooms attached. Each table must be separated from its neighbour in such a way that there is no possibility of one patient seeing another being operated upon. If tents are used, six hospital marquees slung together make an efficient theatre.

The best arrangement is a sheet suspended from a wire by sliding rings. The anæsthetizing room or rooms should communicate direct with the theatre building, and if possible there should be separate accommodation for sterilization of instruments, storing dressings and splints, etc., and a washing-up room for surgeons and anæsthetists.

A method recently introduced in clearing stations of working with "twin" tables is described in Appendix IV.

It is of the greatest importance that water, both hot and cold, be laid on. The supply of hot water could be effectively and simply arranged on the French "bain-douche" system, or the engine of a motor lorry might be utilized for light and heat-power.

The surgical staff should be divided into "Teams." For quiet times two teams are sufficient, they will be under the surgical specialist and second surgeon respectively. Each team will consist of a surgeon, an anæsthetist, a sister, and two orderlies. The advantages of working in teams are obvious, the individual members of each team get to know each other's work and become familiar with the surgeons' methods and requirements. Moreover, when one clearing station is temporarily reinforced from another clearing station, the surgical reinforcements consist, in part, of one or more teams. If possible, in addition to the "team sisters," there should be another sister posted permanently to the theatre, who

would be in charge of theatre equipment, supervise the cleaning of instruments, sterilizing of towels, gowns, gloves, etc., and the upkeep of sterilized dressings, splints, etc. This "theatre sister" should not travel about with a team. There should be a clear distinction between "theatre sister," and "team sister."

As regards the best system of relief in the theatre, this has been rather a discussed point; perhaps the best system, if the pressure lasts over forty-eight hours, is a night and day one, that is to say twelve hours on and twelve hours off. If surgeons get twelve hours off theatre duty they are able to devote some of this off-time to the post-operative treatment of their patients in the wards, and get their rest as well; with less than twelve hours off, this is difficult if not impossible.

An important point is the method of carrying patients to and from the theatre. For this there should be a party of bearers, specially selected men, who should not be taken for other duties so long as they are required for theatre work. They should be divided into day and night reliefs. The best method of carrying patients is on canvas or linen sheets, folded over along either edge and sewn down so as to form hollow pleats through which carrying poles can be run. Several of these carrying sheets and pairs of poles should be available.

At least one of the tables should be fitted with some form of heating apparatus to combat shock in collapsed patients. Probably the best form of apparatus is a wooden box, made so as to fit underneath the table, and without a lid, fitted with electric light bulbs with carbon filaments, the box being connected with an overhead press terminal.

An intelligent and well trained N.C.O. should be attached to the theatre during busy times; he would exercise supervision over orderlies and stretcher-bearers, see to the safeguarding of patients' valuables, and superintend the carrying of patients in and out. He would also be of great assistance in the entering of operations in the book, from dictation. A point worth considering is the prevention of the flooding of the theatre floor and table with washings, inevitable during the irrigation of large wounds, unless some special precaution is taken. A simple and efficacious arrangement, devised by Major R. C. Ozanne, R.A.M.C., S.R., is described in Appendix V.

A device such as is described is easily improvised, and earns the gratitude of the theatre sister.

Certain other minor points may be mentioned:—

The provision of a book-rest in a convenient position against one of the walls, on which a book can be kept for entering the particulars of each operation when finished. This book should be ruled out into headings to correspond with the Record of operations headings in the A and D book, so that the entries may be copied into the A and D book by a clerk.

The provision of a large, covered metal receptacle to hold amputated limbs, pending removal from the theatre. The ordinary galvanized iron

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dust bin does very well. There should be an ample supply of caps and gowns for the orderlies, and arrangements for hanging outdoor caps and jackets outside the operating room.

To meet the probable necessity for rapid transfer of surgical aid to another site, a set of special, light, portable theatre furniture has been devised by Major-General Wallace, Lieutenant-Colonel Goddard and Lieutenant-Colonel Cowell. This set consists of special cupboards, trays, tables, etc., etc., all of which are light and easily packed away, and are arranged to fit into a special trailer. This trailer is made to be attached to the back of a motor lorry. The furniture is complete in every detail, and with it a surgical team can move and open up for operative work in a short time. This trailer and furniture has been fully described by Lieutenant-Colonel E. M. Cowell, R.A.M.C., in an article published in the R.A.M.C. Journal of June, 1917.

Blood-transfusion has come into very general use for the revival of cases of grave wound-shock. If it is intended to employ the direct method, it is well to take the precaution of having a supply of donors ear-marked and classified. The surgical specialist keeps a register of such donors, showing the category to which they belong, and the ward in which they are to be found. Much time is thus saved when a donor is required. Patients convalescent from slight wounds or injuries are the best for the purpose, and as a rule there is no lack of volunteers.

General Routine.—It may be well finally, to discuss a few of the more important points in connexion with the general routine work of a clearing station. As regards the general arrangement of a clearing station, all sorts and conditions are met with, the general arrangement depending in the main on the buildings and area at disposal. Practically all the clearing stations recently put up have been arranged according to a more or less general plan. Appendix VIII gives a diagram which shows the general plan taken from that on which No. 6 C.C.S. has recently been put up. They are in many instances arranged in groups of three or four. Large Geneva crosses should be made on the ground at intervals in and around the group.

Office.—The office work is extremely important and unless it is carefully apportioned among the staff of clerks, much confusion results, and endless mistakes are made.

Probably no two offices are worked in quite the same way, and it would serve no useful purpose to lay down any hard and fast rule for the distribution of duties, but that described in Appendix VI has been found to work fairly well.

A list of all patients on the "dangerously ill" list should be kept hanging in the office for easy inspection by the chaplains.

Every patient placed on the dangerously ill list should be immediately reported to the office, and the clerk responsible for this branch of the work should take steps to ensure that the chaplain concerned is informed without delay.

The daily state, morning and evening reports by telegram to the D.M.S. of the Army, are made easier to compile if some stereotyped form is used by the wardmasters who are responsible for handing in the necessary information from the wards, and a great deal of confusion is avoided thereby. These can be typed or hektographed and distributed in pads to the wardmasters.

A sample is given in Appendix VII.

Feeding of Patients.—It is not proposed to discuss this question as regards bed patients beyond saying that variety is all-important, and it is astonishing how much variety a well-trained head cook can effect.

All patients who are up and able to do so should take their meals in the dining hall; the less food taken into the wards the better. Daily menus should be compiled in advance by the Quartermaster, in consultation with the head cook. Here again variety is important. Instructions, pamphlets, and tables of dishes have been worked out and issued to medical units, and it would be superfluous to enter into details here.

Dental patients should have their meat minced. The dining hall should be conveniently near the kitchen. A pantry should be connected with the dining hall where meals can be dished up, bread cut up, knives and forks kept, etc. A bread-cutting machine is a useful adjunct.

One thousand rations should always be kept in reserve, to meet any unexpected great increase in patients—the components of these rations must be “turned over” from time to time.

Kit, Equipment and Valuables of Patients.—Each patient on admission should be given a bag in which to keep his small kit; the “Lady Smith-Dorrien bags” are issued to clearing stations and are invaluable for the purpose. These bags should remain with the patient and should accompany him on evacuation to the base, or transfer to another hospital. The equipment and arms of patients should be removed to the pack store as soon as possible after arrival, there to be sorted, cleaned, and arranged ready for re-issue to those patients who return to duty, or handed over to the Ordnance Department, as the case may be. During busy times, when patients arrive in large numbers, a large quantity of uniform and clothing has to be dealt with. Much of this clothing has to be cut off, and much is irretrievably damaged. It is advisable to have a “salvage party” to deal with this clothing, one N.C.O. and two men usually suffice, and convalescent patients might be employed. Each ward should stack the clothing just outside the end of the ward, the salvage party goes round at intervals from ward to ward, collects the clothing and removes it to the pack store, there to be sorted and disposed of under arrangements made by the Quartermaster, and in accordance with the Quartermaster-General’s instructions on the subject, issued from time to time.

Ward orderlies, before stacking the clothing for removal by the salvage party, should take care that each patient’s pockets are emptied, and the contents placed in his small-kit bag. This arrangement of a “salvage party” has been found particularly useful during very busy times.

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A sufficient reserve of equipment and rifles should be kept for the purpose of equipping men on discharge to duty. It is a not unwise precaution to get each man for discharge to sign a book, before he leaves, stating that he is complete in arms and equipment; it may save a considerable amount of subsequent correspondence.

Belongings and Wishes of Dying Patients.—Special care should be taken to safeguard the personal belongings of dying and dead patients. The sister of the ward should collect these as soon as a patient's condition becomes grave, should check them after his death, and keep them under lock and key until they can be handed over to an officer. This is a very important point, not always easy to see to in the pressure of heavy work, but the immense value of these things to relatives should not be forgotten.

Messages and wishes of dying patients too should be carefully recorded, and it is well to keep a book in each ward specially for this purpose. This book should always be in the ward, under the charge of the sister on duty at the time. One of the most frequent questions asked by heart-broken relatives is "Did he speak of me before he died, or send me any message?" and one can imagine the consolation which such messages carry with them.

Employment of Convalescent Patients.—Before discharge to duty, convalescent patients should be employed for some days on light duties about the clearing station, such as brushing and ironing clothes, cleaning arms, greasing boots, carrying stretchers, etc. The advantage is two-fold, firstly it is of great assistance in the work of the clearing station, and secondly, it gets men gradually fit for the more strenuous life in front of them.

A great part of this article has dealt with methods of the working of a clearing station during times of pressure. At other times, when casualties are less numerous, a clearing station works much as other medical units, and at such times its functions approach more or less those of a stationary hospital.

In conclusion, do not let us forget that an important part of the duties of a casualty clearing station is to keep its patients as cheerful as possible. Much can be done in this respect, and patients re-act readily to all that is done for them. Their surroundings should be as bright as possible, wards should be well lit and made bright with flowers. Gramophones are much appreciated. Every clearing station should endeavour to organize a "troupe" from among its personnel, and give entertainments for the patients. Battalion and divisional bands and concert troupes which may be in the neighbourhood are always only too willing to lend their services for the good of the patients. In short, every effort should be made to get patients to forget for the time being their wounds and other troubles.

"Mens sana in corpore sano"; and a cheerful frame of mind helps on the healing process.

The writer wishes to express his gratitude to Major-General Wallace, C.B., C.M.G., Consultant Surgeon, for his help in compiling this short article.

APPENDIX I.

REINFORCEMENTS REQUIRED FOR ACTIVE OPERATIONS.

Calculated on the basis that active operations are going to continue over forty-eight hours, and that three operating tables are to be kept going continuously.

Officers: 13, i.e., making a total of 20.

Sisters: sufficient to make up to a total of 22.

N.C.O.s: 10.

Orderlies: 30.

Stretcher-bearers: 100.

APPENDIX II.

A CONVENIENT AND SIMPLE METHOD TO ASSIST THE FILLING UP OF THE "PATIENT'S PARTICULARS" SLIP, A.F., W. 3210.

A wooden board, fifteen inches long and four inches wide is cut and smoothed. On the left hand end of the board is nailed a piece of flannel with stuffing underneath to form a pincushion, and filled with pins. On the right hand end of the board is a pile of A.F.'s W.3210, held in place by a rubber band. A pencil is attached to the board by a piece of string, and, as improved upon by No. 23 Clearing Station, a webbing band is fixed across the under surface of the board into which the left hand can be slipped and the board thus easily held.

APPENDIX III.

A SYSTEM OF CLASSIFICATION OF PATIENTS, AS REGARDS THEIR INTENDED DISPOSAL, BY MEANS OF COLOURED TALLIES.

Small tallies, about $2\frac{1}{2}$ inches by 1 inch, are cut out of tin, punched with a hole at one end, and coloured with enamel (enamel is better than paint, and lasts longer). Each tally is strung with about four inches length of double twine. Five colours are found to suffice, namely:—

Green	...	...	indicating	...	For base—sitting.
Purple	...	...	"	...	For base—lying.
White	...	...	"	...	Unfit to travel.
Red	...	...	"	...	Keep for return to duty.
Red and blue	...	...	"	...	For transfer to another hospital, or to a rest-station, etc., by road.

APPENDIX IV.

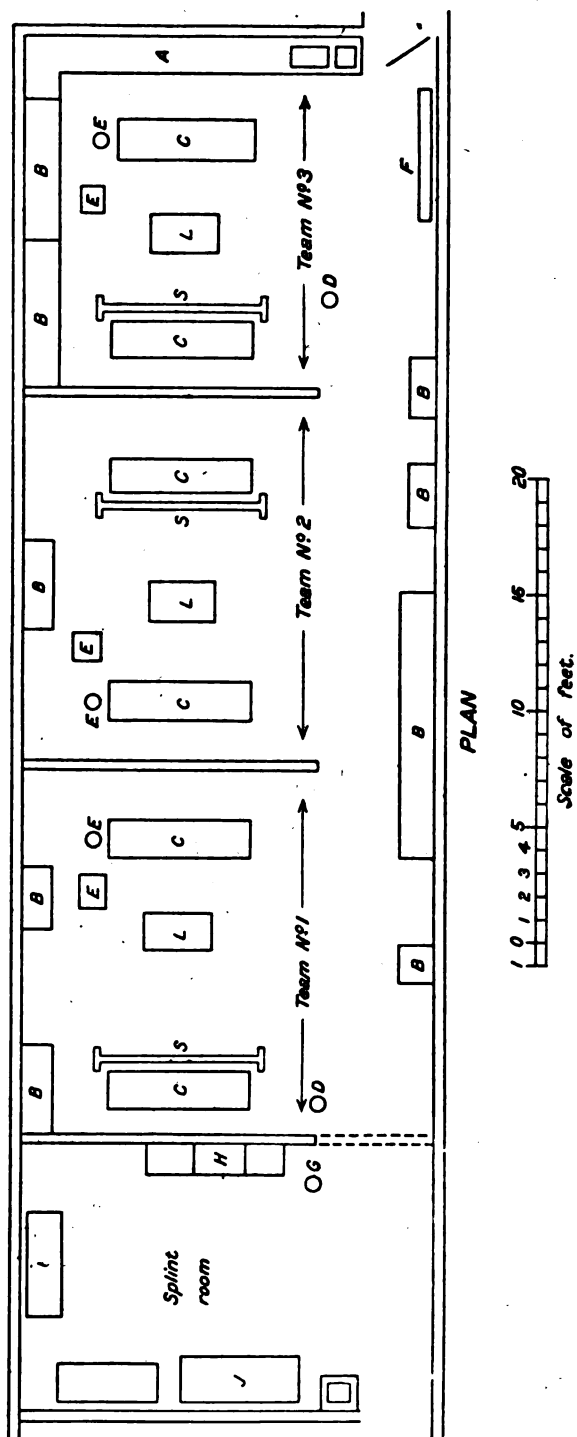
"TWIN" OPERATING TABLE SYSTEM.

The system of providing each surgical "Team" with two operating tables has recently been employed in Clearing Stations, and has been found to have the advantage that, towards the conclusion of one operation, the team anæsthetist can move to his "twin" table and commence anæsthetizing the next patient while the surgeon is carrying out the final stages, such as fixing of splints, etc., on the last patient; the surgeon thus, after washing and changing his gloves, finds his next patient ready.

The general arrangements of the operating theatre for carrying out this system is shown in the diagram, which is taken from the operating theatre at No. 23 Casualty Clearing Station.

This diagram shows also the general arrangement in the theatre of the trailer furniture.

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NOTE.—A. Fixed cupboards and shelves, which can be dispensed with and trailer furniture used.

B. Trailer furniture, containing shelves for dressings, lotion, etc., and wash-up for surgeons.

C. Operating tables, Nos. 1 to 6.

D. Stoves.

E. Anaesthetist's table and stool.

F. Form for bearers
G. Autoclave.
H. Sterilizing rack.
I. Splint rack.
J. Mackintosh wash-up.
L. Instrument table.
S. Movable screen.

APPENDIX V.

SPECIAL TRAY FOR USE ON THE OPERATING TABLE.

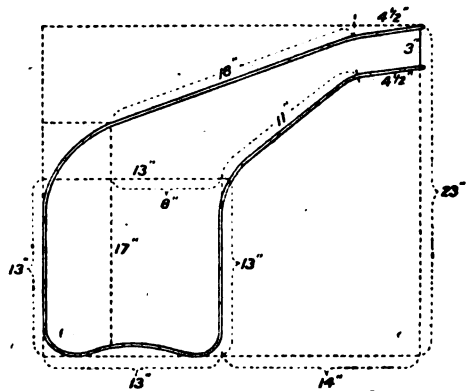
Devised by Major R. C. Ozanne, R.A.M.C., S.R., to catch washings, blood, etc., during operations on large wounds.

It consists of a specially shaped tray, broad at one end, curved in the middle to an angle of 60° , and then tapering to a narrow end, this tapering end being curved downwards on its flat surface. The tray can be placed underneath the sterilized towels, and arranged so that the broad base is under the limb above the wound, and the tapering end clears the table to one side of the surgeon. The raised flange has a rounded edge along its whole length.

Dimensions are shown in the diagram.

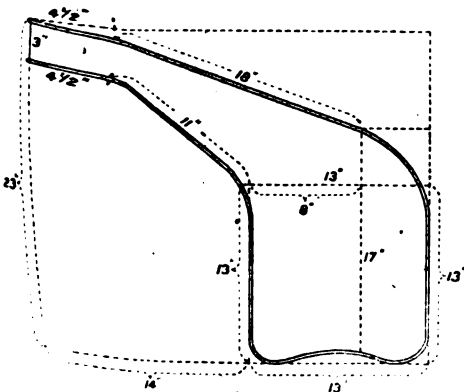


Double line denotes copper rim of tray.



Scale $\frac{1}{2}$ inch in 1 inch.

RIGHT SIDE.



Double line denotes copper rim of tray.

Scale $\frac{1}{2}$ inch in 1 inch.

LEFT SIDE.

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APPENDIX VI.

DISTRIBUTION OF CLERK'S DUTIES.

Head Clerk: Order book. Duty rosters. Daily casualty wires. Letter register. All weekly returns, except those dealing purely with medical statistics. Pay and imprest account. General supervision over all clerical work.

Second Clerk: Medical statistical returns, except A.F., A. 36. " Dangerously ill " list. Death reports. Funerals. Circulation of orders and memoranda. Indexing of admission and discharge books.

Third Clerk: Admission and discharge books, except indexing. Army Form, A. 36. Discharges to duty.

Note.—It will be seen that two clerks, the second and third, deal with the Admission and Discharge Books; this is found to be rather an advantage than otherwise, as it ensures that both are familiar with these books.

APPENDIX VII.

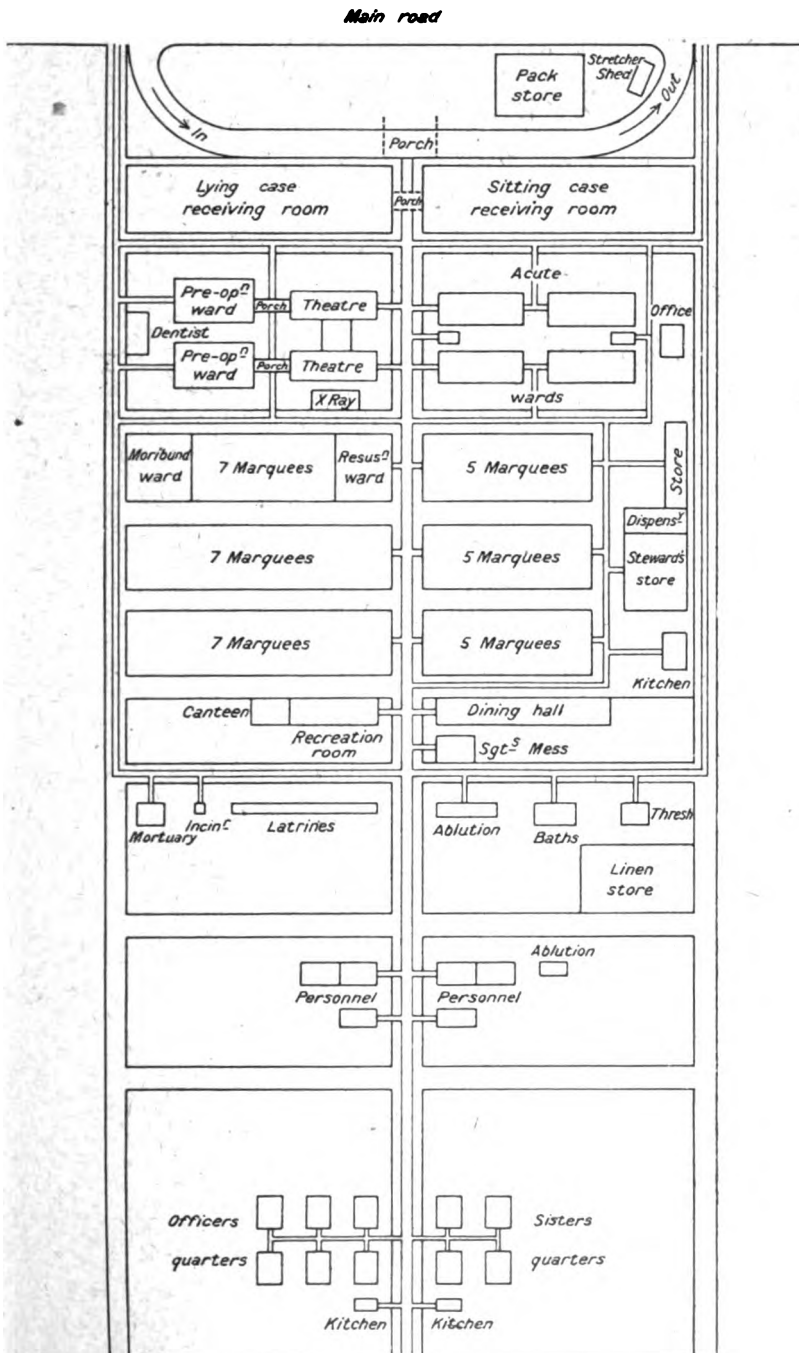
WARDMASTER'S RETURN.....(TIME)																		
WARD	BASE				TRANSFER				UNFIT TO MOVE		CONVALESCENT		DUTY		NOT MARKED		TOTAL	
	LYING		SITTING		LYING		SITTING		S	W	S	W	S	W	S	W	S	W
	S	W	S	W	S	W	S	W										
	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W

DATE.....

.....WARDMASTER

(NOTE) S = SICK
W = WOUNDED

APPENDIX VIII.



Scale 1 inch = 90 feet.

NOTES ON SURGICAL WORK IN A GENERAL HOSPITAL WITH SPECIAL REFERENCE TO CARREL-DAKIN'S METHOD OF TREATMENT.

By MAJOR J. S. DUNNE, D.S.O.
Royal Army Medical Corps.

THE following is written from notes made by me during the period of seven and a half months when I acted as officer in command of the surgical division of a general hospital at a port of embarkation.

The situation of the hospital made it necessary that a certain number of beds should be left in reserve for cases from ambulance trains and ambulance transports when from any cause Cross Channel traffic was held up.

During the period under review battle casualties were treated, also 481 operations under general anæsthetic were performed on local admissions.

Cases admitted had been treated by the various methods advocated for war surgery.

(1) *Flavine*.—A number admitted from a casualty clearing station had been treated by flavine and Z paste and had been kept by that casualty clearing station for a period of from six to ten days. The results were exceptionally satisfactory. The wounds in nearly all were closed, in some the sutures had been removed, in others the sutures were removed in this hospital. Only two showed signs of inflammation, one of these was a case of very severe multiple wounds which would account for the incomplete operation performed. Where the patient can be kept under observation and an early and complete operation performed, this seems an ideal method of treatment.

(2) *B.I.P.P.*.—Cases did not arrive in the same satisfactory condition, most of them were thoroughly septic and one was not favourably impressed by the results of this method in the cases admitted. In my practice, with two exceptions B.I.P.P. was used only as a sequel to Carrel-Dakin's method when the wound surface had become flat or too small for the application of Carrel tubes. In the latter part of the period it was replaced by chloramine four per cent in vaseline.

(3) *Salt Pack*.—Cases arrived bathed in foul smelling discharge; gas gangrene cases arrived with this dressing. Salt dressings were continued for a short time by one surgeon. *Bacillus pyocyaneus* was a constant complication and the hæmorrhagic granulations were a constant drain on the patient's vitality.

One personally preferred a method which was not accompanied by the odoriferous dressings the salt pack entails.

(4) *Carrel-Dakin's*.—These invariably arrive in good condition and if the complete operation had been performed and the technique strictly carried out it was often difficult to realize that the patient was suffering

from a dangerous wound. An example of this, an officer friend of mine, arrived after a very long train journey. He was sitting up on his stretcher looking quite fit. Ten days previously he had been hit by a piece of shell casing two inches by one inch in the right lumbar region, there had been a nasty jagged wound and rupture of the colon. Operation within twelve hours, foreign body and fragments of clothing removed, lacerated muscles and fascia excised, and rent in colon closed. Carrel-Dakin's dressings. On admission temperature normal, one Carrel tube in superficial wound, remainder closed and healed.

Carrel-Dakin's method gave the greatest satisfaction to me and was carried out thoroughly with the following technique. X-ray photos accompanied the patient to the theatre. Ether soap followed by methylated spirit and two per cent iodine were used to disinfect the skin. Free incisions were made exposing all injured structures and opening up dead spaces, foreign bodies, if present, were removed and fragments of clothing looked for; all dead tissues, fascia, muscle and fragments of bone without periosteal attachment to the shaft were excised and all bleeding and oozing were controlled. Carrel tubes were then placed in every part of the wound so as to ensure flow of antiseptic towards the surface. Gauze soaked in Dakin's solution was placed lightly on the tubes. The adjacent skin surface was spread with gauze soaked in sterilized vaseline. The dressing was completed by applying a large Carrel dressing held in place by wooden clothes line pegs. When the general condition of the patient made speed imperative and the local conditions made complete operation dangerous, the injured part was rapidly explored, incisions made to allow the Carrel tubes to reach the depth of the wound. This manoeuvre was so satisfactory that a second and complete operation could be performed without danger of septic absorption. As regards after-treatment, the surgeon assisted by a sister, nurse and orderly, no more than one has for any other method, could carry out the dressings. The same preparations and precautions were used as for an aseptic operation as far as sterilization of dressings, instruments and gloves is implied.

The gloved hands were never permitted to touch the dressings. With each of the team doing his or her allotted part, ten large dressings could be accomplished in an hour. Sisters soon became expert in this technique and taking the place of the surgeon could carry out the dressings with success, the only difference being that the time occupied for each dressing was perhaps a little longer. Delay in rapid improvement led one to suspect errors in technique, such as insufficient opening up of tracks or in comminuted fractures, necrosis of a doubtful fragment, or tubes badly placed.

Bacteria Counts.—This work was very efficiently carried out by a V.A.D. nurse trained in the work. The results were charted. Variations in the curve led to scrutiny of the technique. Of 1917 admissions with

1,100 operations there were forty deaths; many of these were admitted moribund from trains or hospital ships and included 3 cases of tetanus, 2 gas gangrene, 5 fractured femurs, and 2 unoperable neck wounds, 4 knee cases septicæmic on admission, 1 secondary hæmorrhage which developed gangrene after necessary ligature of the femoral artery, 2 buttock cases (one of these had longitudinal fracture of the neck of the femur with infection of hip joint); and many severe head injuries.

The success of the Carrel-Dakin's method was obvious from the first. Secondary hæmorrhage practically completely disappeared from cases under treatment. There were three hæmorrhages, two of these were reactionary, the third was a true secondary hæmorrhage from an external saphenous vein easily controlled without anæsthetic. Patients were cheerful and happy. Dressings were not dreaded and the nursing staff were pleased with the rapid convalescence of their charges.

IMMOBILIZATION OF FRACTURES.

Splints of every pattern supplied by the base medical stores were on charge so that the idiosyncrasy of surgeons in this respect had full scope. The splints most in favour were Thomas's arm and leg with or without superstructure; special splints were also obtained. At the end of the period under review, two officers who made a special study of constructing splints for individual cases were attached. I had not an opportunity of seeing splints for femurs, but their arm and lower leg splints were excellent. Compound fractures both upper and lower arm were amongst the up patients very soon after admission; their apparatus combined with Carrel-Dakin's technique gave very good results. The large Carrel dressings are supplied to this hospital by the Irish War Hospital Supply Depot, Merrion Square, Dublin.

NOTES ON A FEW TYPICAL CASES ARE GIVEN.

Pte. B., shell wound, right thigh, large through-and-through wound, exuding foul smelling pus, thigh brawny and tender, temperature 101° F., pulse 120. X-ray showed comminution of the shaft of femur just below the trochanteric line; there was complete destruction of four inches of the shaft.

First Operation.—Day of admission. Entrance wound enlarged, bone debris and tags of muscle removed and wound washed through with H₂O₂. Femoral artery seen and felt pulsating in the inner margin of wound. Large exit wound packed. Carrel-Dakin's dressings, Thomas's splint. Sixth day patient looks well, discharge still profuse but not foul smelling.

Second Operation.—Ends of bone fully exposed and spiculæ rounded off. Sloughing tags of muscles and fascia excised. Dressings as after first operation. Transferred to England twenty-nine days from date of

admission in good general condition, with good callus at ends of both fragments. Temperature, 98·6° F., pulse 72. Wound closed to a healthy granulating cup of $\frac{1}{2}$ ounce capacity.

Pte. T., shell wound, compound fracture middle third of femur admitted with Carrel-Dakin's dressings, local condition, no swelling and no inflammation. Casualty clearing station report: "Large shell fragments removed. X-ray, comminuted shaft of femur. One large wedge-shaped fragment lying away from the shaft, small piece of metal lying between ends of bone. Good alignment of fragments."

Operation.—Using electric vibrator, the foreign body was felt by exploring finger and removed. The wedge of bone was replaced, Carrel-Dakin's dressings continued. Seventeen days later X-ray showed distinct callus, temperature never above 99° F., pulse 80 to 96. Transferred to England on the eighteenth day.

Pte. M., rifle bullet wound, left leg. Compound fracture femur. Brawny œdema of whole thigh. Temperature 101° F.; pulse 126. X-ray, severe comminution of 3½ inches of middle of shaft, fragments of bone and broken up rifle bullet embedded in surrounding muscles.

Operation.—The wound was opened up to the full extent of the bone lesion, a large quantity of blood-stained pus evacuated, bone debris and one piece of bullet casing removed. Carrel-Dakin's dressings and Thomas's splint, fixed extensions. The discharge became albuminous, and temperature settled down to normal by the twelfth day, but temperature rose again and the discharge became purulent. X-ray showed two pieces of necrosed bone and two fragments of bullet.

Operation.—Fourteenth day. The rapidly closing wound was opened up, the two sequestra were lifted out; using the electric vibrator, the fragments of bullet were localized and removed. The bottom of the wound cavity contained a quantity of bone sand. I made a counter incision and washed out the cavity, using H₂O₂ followed by Dakin's solution. Carrel-Dakin's continued. From this date temperature remained normal. Patient transferred to England at the end of the sixth week. The counter opening was completely healed; the original wound admitted only one Carrel tube to the depth of one inch.

Rifleman S., shell wound left thigh. Entrance anterior surface, exit posterior and external. Compound fracture lower end of femur, local gas infection, knee tense and full of fluid. X-ray report, "oblique comminuted fracture, junction of middle and lower third of femur, lower fragment split longitudinally almost to the knee joint."

Operation.—Day of admission. Anterior wound opened up in the line of the muscle to an extent of about five inches, small fragments of bone removed, the wound washed through with hot saline, exit wound packed, Carrel-Dakin's dressings, Thomas's splint. The knee joint aspirated, about twenty cubic centimetres of cloudy fluid were removed, ten cubic centimetres one per cent formaline injected. The pathologist reported that the fluid

contained pus cells; no organisms were isolated. This patient's temperature remained unstable for one month, but his general condition improved. The knee required aspiration on two subsequent occasions. X-ray twenty-one days after admission showed necrosis of the inner portion of the lower fragments. This was removed and at the same time the knee was aspirated for the third time. Transferred to England on the fifty-fourth day. Temperature normal, wound admits one Carrel tube down to the bone, which was clean and healthy.

Pte. H., shell wound left knee. External condyle of femur almost completely destroyed. Comminution of head of fibula and outer articular surface of tibia. Temperature subnormal, pulse 120, wound foul smelling and discharging freely.

Operation.—Second day after admission. The knee was completely opened by turning up the flap with the patella and the uninjured inner superficial tissues; pus poured from every portion of the synovial pouch. The cartilages and ligaments were excised. Put up on bent Thomas's splint, Carrel-Dakin's dressings.

Second Operation.—Tenth day. Excision of the remaining articular surface of knee joint, same dressings and splints. Three days later the bones were brought together and the splint straightened. Two Carrel tubes were placed in the dead space behind the bones in addition to those on the superficial raw surface. This patient ran a high temperature until the seventeenth day, when œdema and redness were noticed over the calf; under general anæsthetic pus was found in the deep calf muscles. The temperature now settled down and remained normal. Transferred to England at the end of the seventh week, temperature normal, wound covered with smooth, healthy granulations, with apparently firm union of the bones. Dressings, chloramine ointment.

Pte. S., rifle bullet wound, thigh, left. Entrance wound one inch below Poupart's ligament, external to femoral vessels.

Condition: thigh very tense, painful to touch, wound discharge foul smelling, temperature 102° F., pulse 120. X-ray, complete destruction of neck of femur. Fracture of the acetabulum and ascending ramus of the ischium. Fragments of rifle bullet, one in region of fractured ischium, two in the buttock muscles.

Operation.—Wound enlarged to four inches, head of femur extracted, bone debris removed. Pus was found to be tracking up under Poupart's ligament and behind the peritoneum. Carrel-Dakin's dressings. Patient very collapsed. Intravenous saline and stimulants administered before return to ward. Seventh day, general condition not improved, temperature 102·4° F., pulse 140, very toxic, discharge fæcal odour.

Second Operation.—The wound enlarged upwards to Poupart's ligament. The hand passed into this wound felt the lower lip of the acetabulum and part of the ramus of the ischium lying free; both came away, and at the same time the base of the rifle bullet was removed. The cavity was filled with saline, and was twenty ounces capacity. A counter incision was made

to facilitate lavage. A large drainage tube ten inches long, with lateral openings, was passed through the counter opening into the pelvis. This opening was then packed and Carrel-Dakin's dressings continued. This case was dressed daily. The general condition improved rapidly, but temperature and pulse remained unstable for nearly three months. Three more operations were required before all the dead bone and fragments of bullet were finally cleared out. He was transferred to England four months and twenty-four days after admission, wounds completely healed, a large mass of callus taking the place of his hip joint. He was fat and looked quite well.

CAPTAIN BOURNE'S CASES.

Lieutenant M., gunshot wound, thigh, compound fracture femur. Lay out in a shell hole two and a half days; admitted with Carrel-Dakin's dressings and Thomas's splint. Condition, two incised wounds, lateral aspect of thigh just above knee joint, clean, granulating and discharging pus. Thigh swollen. Temperature 99° F. X-ray, "fracture immediately above condyles, no lateral displacement, slight shortening."

Operation.—Wounds enlarged, fracture explored, knee-joint opened, Carrel tubes down to bone and posterior to it, œdema relieved by a few superficial incisions, leg put on McIntyre splint, no extension possible. Twelfth day, wounds closing rapidly; discharge albuminous. Seventeenth day, discharge entirely clear, wounds almost closed. Thirtieth day, union of bone apparent, last Carrel removed, gentle movement of knee at each dressing. Forty-fifth day, dry dressing, good union of fragments. Transferred to England looking perfectly fit.

Lieutenant R., rifle bullet, flesh wound thigh, left; entrance and exit wounds; outer aspect of thigh, brawny induration and dark redness between the wounds; also much tenderness; patient looked very ill; temperature 101.4° F.; pulse 120.

Operation.—Complete opening up of track between the wounds; also of two loculi, tracking upwards and downwards. The exposed muscles looked black and sloughy. Carrel-Dakin's dressings. Temperature remained up for four days, pulse dropped to 90 on the second day; fifth day, microbe count 1 in 10, wound partially closed, skin-graft on small remaining raw area. Transferred to England with stitches removed: patient convalescent.

Lieutenant P., gunshot wound leg, right; compound fracture lower third of femur, admitted with Carrel-Dakin's dressings; Thomas's splint, wounds discharging freely; no pain or tenderness; temperature 99° F.; no operation necessary, as complete operation had been performed at casualty clearing station; Carrel-Dakin's dressings continued. X-ray, abduction of upper fragment, upwards and outwards; displacement of lower fragment; displacement reduced. For the first week temperature varied between 98° and 100° F.; discharge albuminous. Eighteenth day: Wound almost closed, Carrel-Dakin's dressings discontinued. Twenty-fifth day: Bony union obvious thirty days from date of wound. Twenty-eighth day: Transferred to England convalescent.

Captain L., shell wound, thigh, right; flesh, severe; small gangrenous entrance wound, outer aspect of thigh. There was an area of brawny induration; skin a dull red flush. Patient looked very ill; temperature 100° F.; pulse 100; considerable pain. X-ray localization of shell fragment.

Operation.—Free incisions, exposing gangrenous muscle; shell fragment and particles of clothing removed. Dressing eusol pack, as the general oozing could not be controlled. Second day: Pack removed; Carrel-Dakin's applied. Fifth day: Sloughs separated, wound perfectly clean, microbe 10 to field. Twenty-fifth day: Microbe count 1 in 2 fields; wound closed. This wound showed count 1 in 2 fields on the twelfth day, but patient had typical attack of trench fever, in consequence of which the operation had to be postponed. Transferred to England convalescent.

Pte. C., admitted from hospital ship which had been mined. Condition: lacerated wound of inner aspect of thigh; tissues very much soiled and lacerated.

Operation.—Four hours after admission; damaged tissues excised; Carrel-Dakin's dressings. Fourth day, wound closed; healed without incident.

Pte. B., gunshot wound; pelvis and rectum. When taken over, appeared to be dying. Temperature 97° F.; pulse 103. Condition: entrance wound lateral aspect of right buttock. Exit large explosive wound left buttock, both discharging fæces and pus. Unfit for operation; wounds closed cleaned. Second day: General condition slightly improved.

Operation.—Colostomy, glass rod passed through mesocolon; four sutures. Sixth day: Colostomy opened; colon and wounds washed out. Carrel-Dakin's dressings to wounds. Rectal examination: Transverse wound in the posterior wall deep to coccyx.

This case improved rapidly. Slept well and put on flesh, but convalescence was delayed by the following complications: (1) Superficial abscess in posterior aspect of right thigh. (2) Colostomy spur collapsed permitting fæces to soil the wounds. (3) Ischio-rectal abscess on the right side. Five weeks from date of first treatment, the buttocks wounds having almost closed.

Operation.—Removal of coccyx, exposure of large wound of posterior wall of rectum, which was closed with two layers of sutures. Transferred to England one month later on the high road to recovery.

Captain McD., gunshot wound left thigh; compound fracture femur. Admitted with salt pack. Condition: small entrance wound on inner side of thigh just below pubic spine. Large funnel exit wound immediately posterior to great trochanter. Upper part of thigh not unduly swollen, but profuse foul discharge escaped from exit wound when salt pack removed, and a thin turbid fluid with a few gas bubbles issued from entrance puncture; complaining of great pain. Temperature 101° F. X-ray, comminution of the shaft of femur 3½ inches; large wedge of bone, including the lower part of great trochanter lying free.

Operation.—Entrance and exit wounds enlarged to the bone, loose

fragments replaced in line of bone, none removed; Carrel-Dakin's dressings; McIntyre's splint, ten pound weight extension. Fifth day: Wound cleaning, discharge less, temperature, 99° F. Tenth day: Temperature up again; discharge increased and very purulent. Fourteenth day: Second operation, wounds slightly enlarged; four sequestra removed. Large wedge still left in situ, in hope it would unite. Twentieth day: Temperature up to 102° F., wounds very dirty, discharge very offensive. Twenty-second day: Third operation. Removal of loose triangular piece of bone forming bulk of great trochanter. The bone was rotten and cancellous tissues contained thick pus. Buttock wound slightly enlarged. Carrel-Dakin's dressings, Thomas's straight splint. Condition very bad, required intravenous saline and other stimulants before leaving theatre. From this date condition gradually improved. The limb was brought to a position of extreme abduction to keep lower fragment in line with upper fragment. Two months later, entrance wound healed, large posterior wound now a granulating cavity about $\frac{1}{2}$ inch square. X-ray, "good alignment; callus bridging the gap between the fragments." Measurements, only $\frac{1}{2}$ inch shortening. Still in hospital when I left.

These cases are selected as they go far to prove that the Carrel method of instilling a potent antiseptic is both a life and a limb saving technique. Cases which arrived with the treatment in progress, even though the tubes might have been displaced in transit and a further operation proved necessary, could be approached without anxiety. In some other cases I would have amputated without hesitation as the only means of saving life but for this method.

Secondary hæmorrhages need never occur if the technique is faithfully carried out. The method goes as nearly to giving complete physiological rest as it is possible. Dressings need only be 48-hourly except in very septic cases, and there is none of that terrible nerve racking which other dressings entail. Patients watch the progressive improvement of their wounds with the greatest interest.

I attended a lecture on salt pack method in 1916. One of our most eminent consultants, in summing up, stated a well known fact "When animals are wounded they go away to a quiet place and sleep and either die or get better." This was the condition of affairs implied for the salt pack dressing, but in Carrel-Dakin's technique we have the physiological rest reinforced by the scientific destruction of the local poison.

In January, 1917, I had ten days leave to Paris to study the methods of treatment at the various hospitals. I was surprised at seeing the following posted in Dr. Tuffier's wards "*Tout blessé qui suppure a le droit d'en demander la raison à son chirurgien.*" By the courtesy of Dr. Chutro in permitting me to watch various cases from date of operation, one could not help agreeing with the terms of the notice. For our base hospitals I would change the notice to read: "Wounded who continue to suppurate have the right to demand the reason from the surgeon."

GENERAL SURGERY.

As noted in a previous paragraph there were 481 major operations of a general surgical nature. A hundred of these were for appendix conditions with ninety-eight per cent recovery. The incision recommended by Battle was used in ninety-five per cent. I modified it slightly by carrying the incision lower than recommended, by this I left the semilunar fold intact. Jackson's parieto-colic membrane was found in two cases, Lane's bands in three.

Cause of Two Deaths.—First: almost moribund from general peritonitis at time of operation. Second: Portuguese soldier; gangrenous appendix involving caput cæcum; died from obstruction caused by mass of fæces the size of a large orange, producing volvulus.

Appendix Abscess.—This condition was treated by drop irrigation with Dakin's solution, six or eight drops to the minute. The abscess cavity closed with extraordinary rapidity and cases of fæcal fistula yielded in a surprisingly short time.

I hope a full report of this will be published by Captain Bourne, who adapted the Carrel technique for this condition. One case will be sufficient to illustrate.

Operation by the Consulting Surgeon.

Captain X., admitted from ambulance train. Diagnosis appendix abscess. Appendix removed, pus sponged out of deep abscess cavity which tracked down to the left side of the rectum; depth of cavity $9\frac{1}{2}$ inches. Second day: Irrigation commenced; discharge profuse, fæcal odour. Ninth day: Abscess cavity had completely closed, leaving small granulating wound on the skin surface; temperature remained normal from the third day.

Enteric Ulcer.—Two cases: Pte. B., died one month after operation from intercurrent acute general tuberculosis. Captain X. transferred to England convalescent.

Acute Renal Cases.

Perinephric Abscess.—Two; operation; recovery.

Hydro-Pyonephrosis.—One; operation; died.

Acute Cholecystitis.—One.

Operation in two stages.—First, drainage; second, excision of gall bladder.

Note.—A pure culture of paratyphoid bacillus was grown from the contents of the gall bladder, though there was no history of this disease. Transferred to England convalescent.

Gastric Ulcer.—One case, Spanish sailor. The ulcer was closed and gastroduodenostomy performed. Transferred convalescent.

In the work of a large hospital, the best results are obtained not by the work of the officer-in-charge alone, but require in addition the zealous and enthusiastic co-operation of all the staff. I wish to express my thanks, in particular to Captain Bourne, and to the sisters, whose careful attention to detail largely contributed to the success obtained in the use of the Carrel-Dakin method.

A CASE OF LYMPHADENOMA WITH PERIODIC PYREXIA ("PEL-EBSTEIN DISEASE.")

BY MAJOR ADOLPHE ABRAHAM.

Royal Army Medical Corps.

I AM encouraged to publish this case not because I am in a position to contribute any new ideas, but because I think its publication will serve some purpose in drawing attention to a condition which, though well recognized, is comparatively rarely encountered and which offers some points of interest in diagnosis. I venture to think, also, that this particular case is an exceptionally striking example, and in many respects more typical than those which have been previously described. To the *Guy's Hospital Reports* for 1906, vol. lx, Sir Frederick Taylor contributed a very complete and exceedingly interesting account of "The chronic relapsing pyrexia of Hodgkin's disease." His article includes a reference to the previous literature on the subject, a reference which I have found of the greatest value in enabling me to trace the original descriptions by Pel, Ebstein and others. His detailed description of these cases together with a résumé of the types of pyrexia which are encountered I shall briefly epitomize before referring to the case I have myself had the opportunity to observe.

Sir Frederick Taylor points out that the following types of fever may be encountered in cases of lymphadenoma:—

- (1) A continuous pyrexia with slight diurnal variations.
- (2) Alternating periods of pyrexia and normal temperature.
- (3) Daily variations of temperature (in excess of the normal physiological limits) which are higher in the evening than in the morning.
- (4) Mixed types. Cases exhibiting at different times temperature phenomena corresponding with more than one of the above-mentioned types.

Ebstein's article, "Chronic relapsing fever, a new infectious disease," was published in the *Berl. klin. Woch.*, 1887, vol. xxiv, pp. 565 and 837, the first article giving a detailed description of the clinical peculiarities of the case, the second that of its termination with the condition found at autopsy. His case was under observation for 238 days, during which there occurred ten attacks of pyrexia each of thirteen to fourteen days' duration with apyrexial intervals of ten to eleven days. An eleventh attack was of longer duration and was followed shortly before death by a brief twelfth attack.

During life an enlarged spleen was identified but no abnormal appearances in the blood, and no enlargement of external lymphatic glands were observed. At the autopsy there were discovered enlarged bronchial, mediastinal and mesenteric glands as well as nodules of lymphoid appearance in

the lungs, liver, kidneys and spleen. Both liver and spleen were substantially enlarged and both exhibited infarcts.

Pel's case was described actually two years before Ebstein's publication. He referred to his case under the title "Pseudoleukæmia or Chronic Relapsing Fever." At that time the association of pyrexia with Hodgkin's disease was unknown. Again, in Pel's patient, as in Ebstein's, no enlarged external glands were evident although hyperplasia of the spleen, retroperitoneal, mesenteric and bronchial glands was found post mortem.

Pel's idea was that the exacerbations of fever were produced by solid food, a view which nobody else has supported, and one indeed which observation appears completely to refute.

The patient whom I have had the opportunity to investigate was a boy, 17 years of age. (It appears from Taylor's account that this pyrexial variety of lymphadenoma is more frequent under than over 20.) There was no history of any antecedent illness and he was admitted on October 3, 1918, with "influenza." At that time the hospital was inundated with cases of pyrexia all of which, very naturally at that time of epidemic, were in the absence of any distinctive features labelled, provisionally at any rate, influenza, and although it is probable that on his admission the disease from which he was suffering was a mild attack of influenza, no particular attention was attracted or directed to anything which might have suggested the subsequent diagnosis. He was sent to a convalescent hospital on October 15, and twenty-eight days later he was returned with a history of attacks of pyrexia and malaise, of greatly enlarged spleen and of doubtful signs of fluid in the left side of the chest. On his arrival he complained of no symptoms, his temperature was subnormal, no physical signs were present, but the spleen was very definitely enlarged and extended three fingers' breadth below the costal margin.

Three days later the spleen was quite impalpable and in the absence of any other explanation it was thought that the patient was now convalescent from what was a fever of the typhoid group. But on the 22nd there was a recrudescence of pyrexia and malaise with gradual but rapid enlargement of the spleen. Pathological investigations instituted at this time gave the following results:—

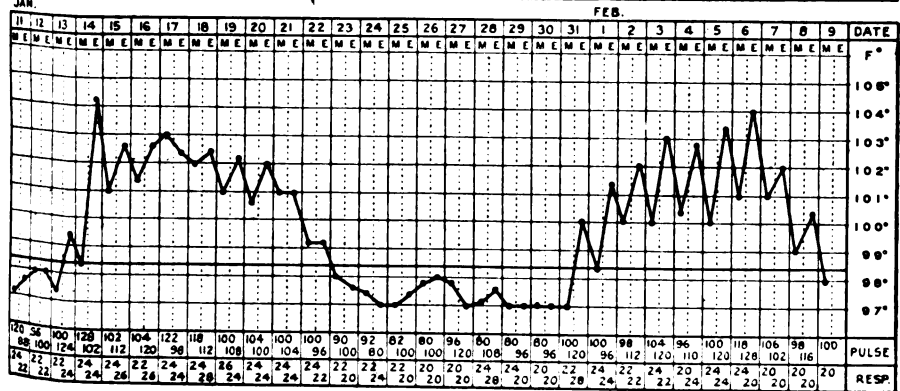
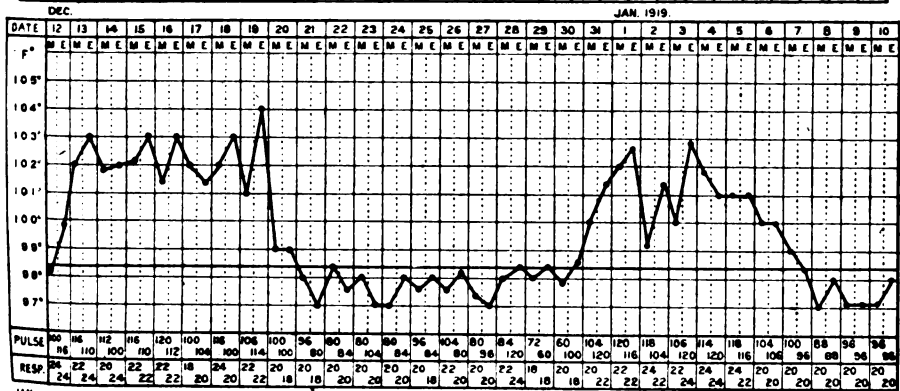
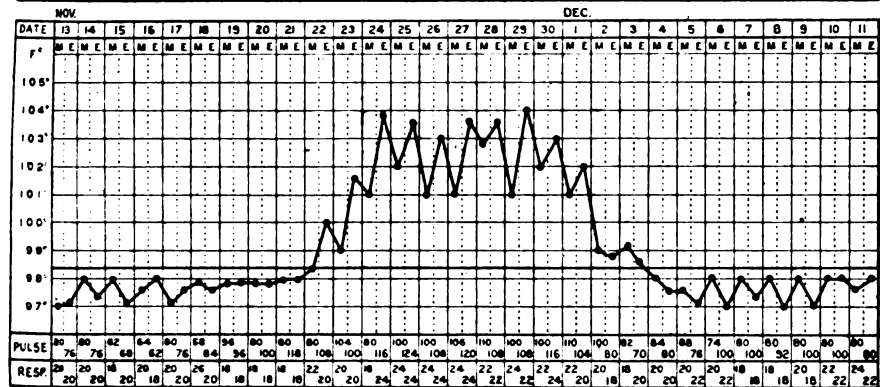
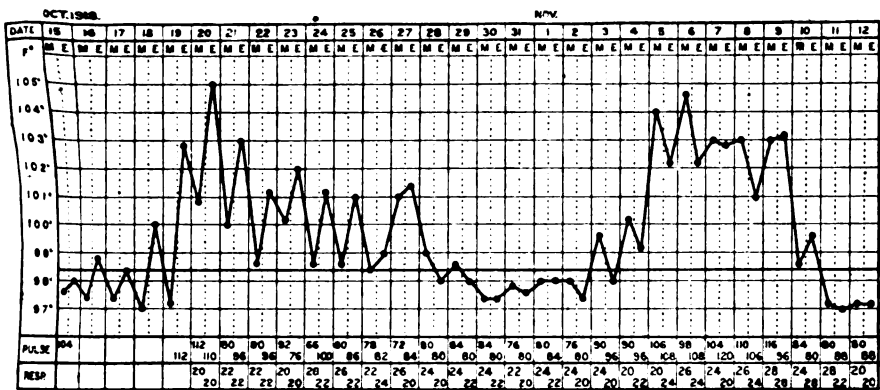
Total leucocyte count 1,560 per cubic millimetre.

Differential count: Polymorphonuclears, 47 per cent; lymphocytes, 39 per cent; large monocytes, 12 per cent; eosinophiles, 1 per cent; mast cells, 1 per cent; erythrocytes, 2,675,000 per cubic millimetre; hæmoglobin, 52 per cent.

Blood film showed anochromasia of red cells; otherwise nothing abnormal; urine, nil; blood culture, negative.

It will be observed that resemblance to typhoid fever is again manifest in the leucopenia.

Apart from the enlarged spleen no abnormalities were ascertainable, there was no trace of enlarged lymphatic glands. It will be remembered



that these negative findings were characteristic in the condition described by Ebstein and Pel.

Many chronic infections are capable of producing an irregular sort of fever. "Anomalous typhoid," "anomalous influenza," tuberculosis, Malta fever, were all specifically excluded. It may be added that the picture of true relapsing fever differs from that of the condition described, in that the periods of pyrexia terminate suddenly by an unmistakable crisis quite apart of course from the unequivocal evidence afforded by the spirilla in the blood. Cases of lymphadenoma without any enlarged external glands are sufficiently rare to excuse the failure to diagnose the patient's illness earlier, but once the condition has been recognized it may be said that the occurrence of such periods of pyrexia with corresponding periods of enlargement of the spleen afford a most characteristic picture.

Osler, in referring to this disease says, "in a few rare instances (of lymphadenoma) Pel has described remarkable periods of fever of ten to fourteen days' duration, alternating with intervals of complete apyrexia. They occurred in two of my cases. Ebstein described it as a form of chronic recurring fever. It is probably due to an intercurrent infection." The last suggestion would appear to be indisputable, and bearing in mind the character of the pyrexia one would suspect the parasite to be of a protozoal character. So far as I am aware no supposed infected agent has been identified. During one pyrexial period of the present case, the spleen was punctured and the blood extracted examined bacteriologically but with negative result.

Little further description of the case is necessary. As will be seen from the chart a remarkable regularity of periods of pyrexia and apyrexia on the whole was sustained although the apyrexial intervals were on two occasions only one half the usual duration. During each period of fever the spleen increased in size although not to so great an extent in the last periods observed as in the earlier intervals. During the apyrexial phases the patient always felt quite well and walked about taking ordinary diet and regaining the four or five pounds' weight he had lost during the previous period of pyrexia. So far as I could estimate, his general condition on February 15 was no worse than on his first admission to hospital.

He was transferred in order to be nearer his home, and it is probable therefore that at some future date a further history of the progress of the case will be forthcoming.

I must express my gratitude to Lieutenant-Colonel W. Turner, C.M.G., R.A.M.C., officer commanding Connaught Hospital, Aldershot, for permission to publish the notes of this case, and to Lieutenant-Colonel Herbert French, R.A.M.C., Consulting Physician to the Aldershot Command to whom I am indebted for much valuable advice in the investigation thereof.

Clinical and other Notes.

THREE CASES OF GONORRHOEAL KERATOSIS.

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AND

CAPTAIN W. H. BROWN.

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GONORRHOEAL keratosis is such a rare complication of Gonorrhœa that we feel justified in bringing to notice three cases which developed simultaneously in a hospital. The first record in British literature of this condition was made by Sequeira in 1910, though the first description was by Vidal in 1893. In December 1916, Graham Little gave a summary of all recorded cases—thirty-eight in number. Since then four cases have been published by one of us (W. H. B.) with other officers: three other cases have been brought to notice by officers of this unit—bringing the total observed in this hospital up to ten, out of a total number of about 40,000 cases of gonorrhœa. Two cases have recently been described by Captain C. Lundie, B.A.M.C., who mentions two more recorded in *Les Annales des Maladies Vénériennes*, 1917. This brings the total number of cases that we have been able to trace to fifty-two.

The three cases now described correspond very closely in all respects with most of those already recorded. The patients had severe toxæmia, marked emaciation, multiple arthritis and iritis.

In none of our cases was there much fever in spite of the severe general symptoms, the morning temperature being rarely over normal, and the evening temperature varying from 90° F. to 101° F. The three patients were suffering from a first and recent attack of gonorrhœa in contradistinction to many of the recorded cases, in which the patients were suffering from second or subsequent attacks.

All three cases suffered from prostatitis, none had epididymitis, knee-jerks were normal. In Case 1, the cerebrospinal fluid was examined after the keratosis had developed and was found to be quite normal as regards cells and albumin, and the Wassermann test was negative.

A point of interest is that these cases developed the keratosis although they were at the time under vaccine treatment (a mixed vaccine of gonococcus and staphylococcus) for the other complications.

Case 1.—M. D., soldier, aged 22. Admitted to hospital October 16, 1918, with acute gonorrhœa, double conjunctivitis and iritis—marked in the right eye. Two days later arthritis developed in the left knee and both ankles. About five weeks after admission he developed a keratosis on the glans penis, in the form of a thick crust surrounding the glans, and a few days later the first evidence of keratosis on the feet appeared, developing fully in about eight to ten days.

Case 2.—F., soldier, aged 25. Admitted September 24, 1918, with acute gonorrhœa. About two months after admission, when still suffering from a gleet,

he developed arthritis of the right knee, and a few days later in both ankles and in the right temporo-maxillary joint. Next, iritis of the right eye appeared. Fully developed keratosis on both feet was first observed on January 6, 1919, three and a half months after admission.

Case 3.—Fi., soldier, aged 38. Admitted October 29, 1918, with acute gonorrhœa, first attack. One month after admission iritis developed in the right eye and five days later arthritis of left knee and right ankle appeared. On January 17, 1919, keratosis was first noticed on both feet.



DESCRIPTION OF SKIN LESIONS.

The changes in the skin were quite characteristic in the three cases, and corresponded in every way with the description in the cases already published. Both feet were affected in each case, though not quite to the same degree, and on the areas of pressure the changes were most manifest. Isolated crusted nodules were also present quite apart from the points of pressure—on the ankles and knees.

In Case 1 (see illustration) the picture was very striking. A well-marked crop of hard cone-shaped nodules was present on the outer half of the ball of the left foot, and where these had become confluent an irregular ridge was formed. Between the third, fourth and fifth toes there was a good deal of desquamation and maceration of the skin, but projecting between the toes, beyond the points of contact, were present the same hard, ridge-like crusts sweeping from the dorsal surface, round the interspace, to the plantar surface. On the great toe there were

no nodules. Over the heel there was a diffuse hyperkeratosis, with one or two hard limpet-shaped crusts breaking through the skin. Below the internal malleolus a large, isolated, flat-topped crust was present. On the knee also there were two similar nodules.

The toes had a dusky cyanosed appearance. On the right foot very similar conditions prevailed. General hyperkeratosis on the sole of the foot, but mainly on the areas of pressure. Similarly the crusted condition was present on the outer half of the ball of the foot and around the fourth and fifth toes.

Case 2 presented very much the same features as in Case 1, but in a less marked degree—generalized keratosis on the soles, with isolated hard, cone-shaped nodules embedded in the epidermis. In the early stages the thick corneal layer of the epidermis could be separated from the underlying hard, brown, cone-shaped crust, which could then be picked out, leaving a raw, somewhat warty, base. This feature has already been described in the case recorded by Brown and Davidson.

In Case 3, the eruption was very sparse and consisted of three or four small typical, hard, cone-shaped nodules on the balls of both feet. On removal of the corneal layer of the nodules, a hard lenticular mass was found which on maceration was seen to consist of squamous epithelial cells.

In the three cases the hands were not affected and the finger-nails showed no changes.

The three cases had to be transferred soon after diagnosis and we were unable to make further observations on them except in Case 1, where there was great improvement after a few days' massage with castor oil, masses of the hardened tissue being then readily picked off.

A CASE OF PRIMARY SARCOMA OF THE LIVER.

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The following case is interesting on account of its rarity.

The patient, a man aged 42, was admitted to the hospital in a condition of advanced emaciation. He stated that his health had been good until about a year previous, when he began to feel pain in the stomach about half an hour after food, and had a constant sense of discomfort during the intervals between meals. Flatulence was a prominent feature, but there had never been any vomiting. There was no noteworthy constipation. There had been a steady progressive loss of weight.

On examination, the abdomen was found to be distended by a large smooth solid tumour, extending from the costal margin to the brim of the pelvis; at its lower edge a distinct fissure could be felt in the middle line. There was some bronchial catarrh, with a persistent irritating cough. The urine was normal

A blood-count showed only a slight secondary anæmia (red cells, 4,000,000; hæmoglobin, 70 per cent); total white cells, 10,000; and differential white count normal. A Wassermann test was negative. The patient gradually sank, and died on the fourth day after admission.

Post-mortem Examination.—The body was greatly emaciated. There were no signs of injury, discoloration, jaundice, or external growth. The most noticeable feature was a bulging forwards of the upper part of the anterior abdominal wall. No enlarged subcutaneous veins were visible.

On opening the abdomen, the liver was seen to have a mottled appearance, and to be greatly enlarged, extending on both sides as low down as the iliac crests. The surface of the liver presented a large number of greyish-white areas of new growth, some of which were about the size of a pea, while others were larger, umbilicated, and slightly raised above the surface. The general "mottling" appeared to be due to the coalescence of these nodules, forming large greyish patches, which were little, if at all, raised above the surface.

The great omentum was spread out, and appeared to be normal. In the gastro-hepatic omentum, and in the mesentery, slightly enlarged lymphatic glands could be felt, and those about the head of the pancreas were particularly large and matted together. There was only a small amount of clear fluid in the abdomen. The stomach, pancreas, intestines, kidneys, and suprarenal bodies were thoroughly scrutinized, but nothing abnormal was found. The liver was easily removed from the body, being quite free from adhesions, and was found to weigh $14\frac{1}{2}$ pounds, and to measure twenty-three inches in transverse diameter. The gall bladder and bile ducts were free from growth.

The lungs showed numerous small whitish patches scattered over the surface. These were almost uniform in size, none of them being larger than a sagò grain. The lungs were free from adhesions, and there was no effusion into the pleural cavity. The mediastinal glands were slightly enlarged. The heart and pericardium were normal. The head was not allowed to be examined.

Morbid Anatomy.—When the liver was incised, no abscess or cystic growth could be found. The left lobe consisted almost entirely of a firm whitish growth, with the exception of a small seam of liver tissue running across the surface near the lower anterior border. The growth extended to the right beyond the middle line, and formed the greater part of the substance of the upper and anterior portions of the right lobe, penetrating backwards to within two inches of the posterior surface. Small nodules, separate from the main growth, were scattered about in the remainder of the liver substance. The liver tissue was friable, and pale and fatty in appearance.

Pieces of the liver and of the lungs, and some of the enlarged lymphatic glands were excised, fixed, and hardened in ten per cent formalin, and sections cut and stained in the usual way with hæmatoxylin and eosin. On microscopical examination, the growths from each of the above tissues were found to present the same histological features, and the following description applies to the appearance of the sections made from the liver.

Histological Characters.—Microscopically the growth was seen to exhibit an alveolar structure—strands of fibrous tissue forming alveoli which enclosed groups or clusters of cells. The fibrous strands varied considerably in thickness, some consisting merely of a few fibres, while others formed well-marked bundles.

The cells enclosed within the alveoli showed great diversity in size, shape, and numbers. In most of the alveoli the predominating cell was rounded or polygonal, with abundant cytoplasm and a deeply staining round nucleus. Other alveoli showed a preponderance of small round cells with scanty cytoplasm. A number of spindle-shaped cells could also be seen in most of the alveoli, mixed with the above types of cell. No fibrous tissue was observed between the cells which formed the clusters.

The blood-vessels were rather scanty, ill-formed, and of a capillary type, and hæmorrhages were present. The liver cells adjoining the margins of the tumour showed signs of degeneration. They stained badly, were granular, some were irregular and broken, and their nuclei were difficult to discern, or altogether absent. Scattered among the liver cells in this region were numerous dark pigment granules, and many well-stained cells similar to those found in the tumour. These cells appeared to have advanced from the main growth along the blood-channels; in fact some of the vessels in cross section were seen to be packed with them.

Summary.—The growth under consideration was undoubtedly malignant, and, in view of the facts, firstly, that no evidence of a growth could be found after a most careful search in any of the other abdominal organs; and, secondly, of the enormous size of the growth in the liver, it may reasonably be inferred that the tumour was a *primary* growth in the liver. It is, of course, known that very large tumours in the liver may be secondary to quite small growths in other organs, but here, as already stated, no such growth could be found [6].

The determination of the precise nature of many malignant tumours of the liver is frequently difficult. In the present case, however, all who examined the sections of the growth were agreed that the microscopical characters were those of a mixed-cell sarcoma of an alveolar type.

Primary sarcoma of the liver is a decidedly rare growth, as the following brief résumé of the literature shows. Hale White, in 1890, recorded the fact that not a single case was met with at Guy's Hospital during the twenty years, 1870 to 1889, both inclusive. Byrom Bramwell and Leith, in 1897, were only able to collect twenty-five cases, and they concluded that few of these could be regarded as true examples. Vecchi and Guerrini critically examined forty-five published cases, and accepted only twenty-one as being undoubtedly primary sarcoma of the liver. Pepere also tabulated a list of forty-five cases, and Rolleston collected thirty-two cases in adults.

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A CASE OF MEDIASTINAL TUMOUR ASSOCIATED WITH CEREBRAL HÆMORRHAGE.

BY MAJOR W. F. M. LOUGHNAN, M.C.

Royal Army Medical Corps.

THE patient, Private P., aged 40, first complained of vomiting on October 12, 1918. After two days he was much improved, and the vomiting had ceased. On October 15, 1918, he again suffered from vomiting, and on the same date he had a convulsion which was followed by a general tonic contraction of the muscles of the arms and legs, with slight tremor of the muscles of the right thigh; complete insensibility, with unequal pupils, jaw rigid and tongue bitten. After the muscular system had relaxed, the unconscious condition continued and became more profound, the breathing became slow and he died at 12.30 a.m., October 16, 1918. No history of previous fits.

Post-mortem Examination.—Body marks: No external evidence of injury. Brain: On surface of upper portion of the left parietal lobe a small subdural hæmorrhage was present. On section just posterior to the fissure of Rolando, a large blood clot with disorganized brain tissue, was found occupying the whole of the left parietal lobe. The clot extended into the left ventricle, and through the foramen of Monro into the right ventricle. No evidence of arteriosclerosis in the vessels of the circle of Willis. No fracture of the skull. Chest: Lungs show small adhesions at both apices. Lung tissue not remarkable except for moderate œdema of both lower lobes; and a small amount of slightly cloudy yellow fluid in left pleural cavity. Heart: Normal in size, no demonstrable valve lesion. Aorta shows no evidence of sclerosis. Tumour: In the anterior mediastinum extending from the region of the thymus gland downwards and well over the right auricle of the heart is a tumour mass which when dissected out, measures 6 inches by $3\frac{1}{2}$ inches by 3 inches. Its greater surface is very firm and solid to touch. The inferior surface is convex in contour, representing the surface adjacent to the right auricle. The anterior surface of the mass has a spongy consistency. On longitudinal section, beginning at the anterior surface, a considerable amount of blood was released from dilated vessels, having the appearance of a hemangioma; in depth this portion of the tumour measures $\frac{3}{4}$ inch. The remainder of the tumour is a firm white schirrus tissue, apparently of a dense fibrous nature. It contains no evident blood-vessels. At the upper pole of the tumour is a well-defined glandular structure thought to be the thymus gland; it has a definite capsule and shows no gross evidence of invasion by the tumour mass. Glands: The tracheo-bronchial glands are considerably enlarged, and on section show a soft pigmented surface. Abdomen: No apparent gross abnormalities present of any of the abdominal contents, with the exception of slight general enlargement of the mesenteric glands and the condition of the spleen; the spleen measures 10 by 6 by $3\frac{1}{2}$ inches. It is of normal consistency, and not remarkable in appearance except for size. On section the colour is uniformly deep red with the normal markings obscured. The only other feature of interest in this case was a slight protrusion of the left eyeball, with the pupil somewhat larger than the right.

Histological Examination.—Tumour: The tumour is composed of cells of the lymphoid series, which are usually somewhat larger than fully developed lympho-

cytes. The stroma consists of thin strands of tissue, with fairly numerous lymph sinuses, or capillaries. In some places the strands of tissue have developed into rather thick bands of connective tissue containing few cells. There are very few mitotic figures and no giant cells. No eosinophiles are present. The tumour is about the same in appearance everywhere, the only exception being one large hæmorrhagic area. One slide shows part of a lymph node immediately adjacent to the tumour. In another part of the same section, there is some muscle and fat tissue adjoining the tumour. No thymus tissue was seen. The tumour is a lympho-sarcoma probably arising from a mediastinal lymph node. Possibly arose from some atrophic thymus tissue. Liver: Marked central necrosis. No tumour cells in the capillaries. Kidneys: Glomeruli congested with an exudation of red cells into the glomerular spaces. Some acute degeneration of epithelium. Lungs: Section 1. Broncho-pneumonia and bronchitis. The air cells between the broncho-pneumonia areas show œdema, with many endothelial cells. Section 2. All air cells equally filled with fibrin, and polynuclears and red cells. The alveoli are dilated and the septa often broken. Streptococci are fairly numerous. This appears to be a section from a large, rapidly spreading lobular pneumonia, or lobar pneumonia. Section 3. Abscess formation, spleen, hyperplasia, pancreas and adrenals normal.

Pathological Diagnosis.—Lympho-sarcoma (mediastinal); broncho-pneumonia streptococcic; focal necrosis of liver; acute glomerulo-nephritis (slight).

I am indebted to Captain N. A. Beetham, R.A.M.C., for the clinical notes, and to Captain J. L. Stoddard, M.C., U.S.A., for the histological report.

A NOTE ON THE VARIETY AND LATENCY OF ORGANISMS ON MISSILES IN THE TISSUES.

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AND

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AND

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THE latency of organisms in certain cavities and tissues of the body is well-known. Perhaps the best known of this persistence are the presence of the enteric bacillus in the gall bladder, and the staphylococcus in the bones, months or years after the initial infection has died down. A similar condition has been frequently noted in war wounds, both of the bones and soft tissues, where after varying periods of quiescence a "flare up" occurs and acute symptoms again supervene. This recrudescence of activity has also been noted to occur with foreign bodies lying apparently quiescent in the tissues. It seemed that useful information on this subject might be gained by systematic examination of missiles removed from the tissues. At my suggestion Captain Slade and Dr. Laws co-operated, and missiles apparently sterile, or at least giving no clinical indication of infection were sent to them for examination. The missiles were removed with

the usual surgical precautions and dropped into a sterile tube. In some cases they were shelled out of the fibrous tissue capsule in which they lodged, in others the foreign body was removed in the capsule—which was later removed before culture. The missiles were removed for varying reasons—either their being subject to pressure, causing pressure on nerves or interfering with movement. Forty-four specimens were sent for examination, of which nearly fifty per cent were found to be sterile. The table shows the varieties of the organisms present. Of twenty-three missiles from which cultures were obtained, the staphylococcus was present in ten cases. Putrefactive bacilli in six cases, were next in the order of frequency. In two cases the *Bacillus tetanus* or organisms of that type were found. The analysis shows that, shell fragments, contrary to what might be expected are more often sterile than bullets. The length of time the missile remained in the tissues varied from one to thirty months. This examination has shown that the *B. perfringens* may survive a period of seven months. In this case the bullet was removed from the tibia, where it was lying without causing any apparent lesion in the surrounding cancellous tissue, as visible from an X-ray plate. After removal no ill-effects followed and the wound healed by first intention. The second case of interest is that of Cpl. Hardy. A fragment of shell was removed from the forearm and sent for examination, streptococci and the tetanus bacillus were found. In this case the wound suppurated, immediate on receipt of the bacteriological findings, anti-tetanic serum was administered and no symptoms presented themselves.

From a surgical point of view the following conclusions may be drawn:—

- (1) That most pyogenic organisms can persist in the tissues for periods up to at least thirty months.
- (2) That they may at any time give rise to inflammation and that this is possible in at least fifty per cent of cases.
- (3) That prophylactic measures before removal might be useful.
- (4) That if possible the missile be removed in its fibrous tissue capsule.
- (5) That if such be impossible careful disinfection of the cavity be carried out.

We are indebted to Brevet Colonel T. Gowans, R.A.M.C. for permission to publish this paper.

ANALYSIS.					
		Total		Percentage	
1. Number of examinations	.. ..	44	.. ..	50	
2. Number sterile .. ..	.. ..	21	.. ..	50	
3. Number giving cultures .. ..	.. ..	23	.. ..	50	
4. Organisms. Varieties:					
Staphylococcus	.. ..	.. ..	.. ..	10	
Streptococcus	.. ..	.. ..	.. ..	2	
					(never in pure culture)
<i>Bacillus perfringens</i>	.. ..	.. ..	.. ..	1	
„ <i>tetanus</i> .. ..	.. ..	.. ..	.. ..	2	
Putrefactive bacilli	.. ..	.. ..	.. ..	6	
Leptothrix	.. ..	.. ..	.. ..	1	
5. Number of bullets (sterile)	.. ..	4			
„ „ (organisms)	.. ..	11			
6. Shell fragments (sterile)	.. ..	16			
„ „ (organisms)	.. ..	11			
7. Time of latency:					
(1) Staphylococcus	.. ..	.. ..	3-4-5 months		
(2) Staphylococcus and putrefactive bacillus	.. ..	.. ..	7 „		
(3) Leptothrix	.. ..	.. ..	1 month		
(4) Gram + Bacilli	.. ..	.. ..	3-15 months		
(5) <i>B. perfringens</i>	.. ..	.. ..	7 „		
(6) Staphylococcus and diphtheroid bacillus	.. ..	.. ..	30 „		
(7) <i>Streptococcus pyogenes</i> and <i>B. tetanus</i>	.. ..	.. ..	6 „		

Lecture.

THE MEDICAL OFFICER IN CHARGE OF A DIVISION.

By MAJOR ADOLPHE ABRAHAMSON.

Royal Army Medical Corps.

Officer in charge of the Medical Division, The Connaught Hospital, Aldershot; Assistant Consulting Physician to the Aldershot Command.

(A Paper read before the Aldershot Command Medico-Chirurgical Society.)

I SUPPOSE there exists at some time or other in the life of every human being a desire to write a novel, and I do not think there can be any reasonable doubt that there is a decided tendency for the author to portray in the hero of his first production an idealized conception of himself, a combination of what he really is; what he fondly and foolishly imagines himself to be; and what he would like to be. And in dealing more generally with the illustration of a character, G. K. Chesterton has said, in his work on Dickens, that whenever we meet in a book a preposterous, impossible and obviously exaggerated sort of character, we know by the tenets of high art that he is almost certainly drawn from real life.

I make this preliminary explanation by way of dissociating any personality from my paper to-night. Nobody can write of an official position he has occupied without identifying himself to some degree at any rate with his hero (if I may use such a term in this connexion) and, what is far worse, inviting the obvious criticism that he is indulging in a character sketch. Let me ask you, therefore, in an appeal *ad misericordiam* to remember G. K. Chesterton's generalization; and although I must necessarily draw upon my own experience, or rather my experiences, you will be kind if you will think quite impersonally.

The Regulations of the Army Medical Service state that the officer in charge of a division will be responsible to the officer in charge of the hospital for the proper treatment of the sick and good order and management of the division under his charge. That he will also be responsible for the good order, cleanliness, and general sanitary condition of the wards, passages, staircases and other accessories in his charge. And that he will detail to wards such officers as may be posted to his division for duty.

If I were to sum up the matter to my own way of thinking, I should say that the divisional officer may be everything or nothing in his hospital. On the one hand, he may be one of those relatively placid persons whose key-note in life is that blessed word administration, or that still more blessed word organization; who sits in an office generously provided with clerks, decides to which of his subordinates are to be allocated certain duties, issues corresponding directions, signs his name on the necessary occasions—and that is all. And I will ask you to believe me when I assure you that one encounters divisional officers (not in the Aldershot Command) who correspond very nearly to this description.

As another extreme, he may be a restless, intense sort of creature, excessively active and energetic, in a perpetual state of tension from solicitude for results, with little or no belief in the capacity of anybody to undertake any sort of

responsibility or achieve any sort of sustained work ; himself so conscientious and aware of his own capabilities that he has little faith in the conscience or capacity of anybody else, and most unwilling to delegate or relinquish any duty of importance to those under his charge. Both types, it is almost unnecessary to point out, will make unsatisfactory divisional officers, and the ideal man will be a man of balance occupying a position somewhere between the two, tending, as his instincts and abilities permit, in one or other direction—the administrator or the performer.

Regular officers, and especially those who in times of peace held the post of divisional officer, will probably be prepared to rend me for my temerity, but I think it ought to be realized that a comparison between their work in the past and the work imposed by the exigencies of war and association with an amateur conscript army is hardly possible. In peace time, military hospital routine may have taken a stereotyped course, and this more especially as regards medicine, in which connexion it is pertinent to point out that although the "surgical specialist" has always had a position of recognition with corresponding extra pay for his responsibility, no such thing as a "medical specialist" has even to this day come into official recognition, notwithstanding the multitudinous occasions upon which from every quarter, official and unofficial, high and low, a medical specialist's opinion is requested and utilized.

I am going to speak, you will observe, purely of a medical division, for I have no doubt a surgical colleague would advance much the same line of reasoning as I, and probably point out how war time conditions have evolved similar differences from those in peace. But, as I shall have occasion later on to elaborate, such differences are far greater in the case of medicine, and it is probably the differences which have encouraged me to attempt the production of a paper on the subject.

To begin with, however great the paradox, a divisional officer may know no medicine beyond the elements which any qualified man can hardly avoid acquiring. The first few minutes in his office would be devoted to the delegation of various duties to the officers under his rule, and Temporary Lieutenant *Æsculapius*, in addition to his other duties, is created "medical specialist" with no emoluments save of course the advantage, which he is only too glad to secure, of extra clinical experience. Clinical responsibility will then in the case of the divisional officer cease spontaneously ; and although officially he is responsible, actually he will, if Lieutenant *Æsculapius* be a capable physician, enjoy complete immunity from corresponding mental exertion.

But asking you please to remember my reference to Mr. Chesterton, I think the ideal divisional officer should be the best all-round clinician in the hospital, and that in no circumstances should it be possible for him as leader of his side to repudiate any responsibility from lack of experience or knowledge. He may not be the best neurologist, the best oculist, the best pathologist, or the best authority on tropical diseases, but he should be regarded and looked up to as the best general physician for an all-round consideration of a case, with a capacity both to recognize when a more special opinion upon some feature is necessary, and how to criticize and utilize this opinion.

And it is manifest that were this all, the selection of a physician of sound experience would be all that was necessary, but there is an element, and a very

large element, in a military hospital comprising the innumerable details which go towards the efficient organization of hospital routine, and in order to give some impression of what I mean, I will ask you to visualize the divisional officer in his work, not perhaps during a strictly average sort of day, but a day which is reasonably typical of many.

His breakfast will, if he is wise, be the largest that the food restrictions of the time will permit, and it is well if he is blessed with a good digestion and a very adaptable alimentary canal ready to assimilate foodstuffs not so much at orthodox meal times as at such odd moments as convenience offers.

He will arrive at the hospital shortly after 9 a.m., and at once find himself plunged into a maelstrom of responsibilities and anxieties. The observation ward will first attract his attention as containing a variable number of cases which have been admitted during the night by the orderly officer, and these are swiftly transferred to appropriate permanent wards, for the guiding principle for a ward of this description is that it should be almost always *empty*. In the vast majority of cases, it is true, a broad distinction between serious and trivial cases is sufficient as a temporary "diagnosis," but ever before him is the fear of overlooking an early case of some infectious disease, measles or scarlet fever for example, or that most insidious of all diseases, cerebrospinal fever. The admission of one of these to a general ward means quarantine for perhaps a fortnight, with the delay of some five-and-twenty men fit for duty, with consequent inquiries and reprimands.

A few minutes are then snatched for official correspondence—the ideal divisional officer must have no private cares, worries, affections or responsibilities; his division must be father and mother, wife and child to him—and then in a sort of overwhelming flood come an indefinite number of urgent requests and appeals converging from every quarter of the Command outside the hospital as well as from within.

The officers in charge of the different wards are anxious for a consultation upon their most serious cases. One has a man who is blanched to an alarming degree of anæmia from a gastric ulcer, a second is uncertain whether a case with violent headache has or has not the dreaded spotted fever. In a third ward is a patient with symptoms suspicious of some acute surgical condition, and the question of transference to a surgical colleague is urgent. A fourth officer is solicitous about the critical state of his pneumonia patients, whilst a fifth has his wards blocked with a bad batch of chronics or undiagnosed cases, and has sent out the S.O.S. to enable him to get clear. But in the meantime two officers have been sent in from a distance for a specialist's opinion; the President of the Standing Invaliding Board urgently requires the presence of an expert upon a difficult case; the matron has two sick nurses whom she particularly wishes to be seen at once; and clerks are waiting with the list of a hundred Expeditionary Force men who arrived in the small hours of the morning, and who must be seen with the least possible delay, so that the diagnosis of their conditions, and to a considerable extent their prognosis, may be telegraphed to an impatient War Office.

But nevertheless the commanding officer must receive attention first. He is fuming over some complaint—he receives querulous complaints every morning. It may be that Lady Bountiful's V.A.D. hospital is nearly empty and she must receive five-and-twenty relatively convalescent patients to-morrow. She

particularly desires that they must be nice men, and wishes to point out that of the last batch, Pte. Smith did something or other and Gnr. Jones something else, and so five-and-twenty eminently desirable blue-clad warriors must be found for her.

Or something much more serious may be in the air; one of the inevitable complaints about the inhuman or inadequate treatment of some inmate has been sent to the War Office, and an explanation is demanded and must be produced at once. I think it was the late George Grossmith who in one of his amusing drawing-room entertainments depicted the sequence of events in a business firm when the "boss" arrived with a headache and vented his spleen upon his managing clerk, who transferred it in turn to the clerk just below him, who passed it on to his junior, and so on until it reached the office boy, who kicked the cat. Well, something of the kind happens in military circles. Olympus frowns, and the general who is chief of the local medical services has to bear the brunt. His annoyance is communicated to the commanding officer of the hospital which is at fault; he fulminates his charge against the divisional officer, who if he has any sense at all will refrain from kicking the cat, because the military cat can scratch, but will take it all as part of the cross he has to bear. Or the complaint may be a purely local one; the auditors point out that we are consuming more than our legitimate allowance of bread, or somebody else is appalled at the awful consumption of drugs. And by this time a neurotic staff officer has dropped in to see a doctor, and although there is no such thing officially as a medical specialist, still he must be accommodated with what passes unofficially as an expert, and only the tact and special capacity which is developed by the necessity of doing sixty minutes' work in every hour can put a stop to the recital of his symptoms and send him away silenced if not satisfied. And indeed of this there is urgent need, for Lieutenant Robinson is sick this morning and has just telephoned that he is not coming, and his wards must be attended to. A unit some miles out must be instantly supplied with a medical officer. Captain Brown is going away on leave on account of urgent private affairs, and a substitute must be provided. Incidentally it may be noted that whenever an officer wants to get away, he manages somehow to convey the impression that his duties can easily be performed by anybody handy who has an odd ten minutes a day to spare; when, however, it is suggested that he can add somebody else's duties to his own, one gathers that Hercules with all his labours enjoyed a very soft time in comparison.

Dovetailed into the more solid details of the morning's work are a large and interesting variety of classifiable and unclassifiable emergencies, all of which are submitted to the divisional Pooh Bah. Of course, he is expected to have at his finger-tips the Army Council Instructions which apply to the Army Medical Service, and these, according to requirements, are undergoing frequent—sometimes revolutionary—changes.

Thus, quite apart from the broad details applying to British troops, Colonial patients demand disposal upon lines laid down by their own authorities, and with Australian, Canadian, South African, New Zealand, and American troops, all in one hospital simultaneously, opportunities for giving offence by a disregard of special requirements are manifestly frequent. And even such differentiation

is frequently insufficient, for each category imposes separate distinctions on its own account. Furthermore, like most generalizations, A.C.I.s seem to take a fiendish pleasure in applying to every sort of case except the one under consideration.

To answer the question, "What am I to do with such and such a circumstance?" demands not merely all the official knowledge, but often all the ingenuity, casuistry, and eloquence which the divisional officer can command. "What disease am I to call a man sent back from France to have a new glass eye fitted?" will not be answered by an appeal to the official nomenclature of diseases, nor will the same manual afford much assistance in the classifying of a patient sent home to have some alterations made to a surgical boot!

Dangerous though it sounds, it is well for him to be a bit of a lawyer to know the rights and wrongs of things; and he may even be called upon to decide to whom legally a corpse belongs!

And, further, there are the perpetual grievances and complaints from all and sundry who regard the divisional officer as an inexhaustible fount of sympathy and discretion, as well as an intermediary to higher powers. And if he is fitted to survive, the divisional officer learns how he must mollify one and coax another, persuade a third and flatter a fourth, play on the vanity of some and the conceit of others, find a way to persuade both parties in a dispute that both are in the right, and if he should be so unfortunate as personally to be engaged in a difference of opinion, get his own way whilst letting the other believe that he is getting his.

And so the morning goes on, and the divisional officer is enjoying the mental experiences of a Cinquevalli juggling simultaneously with a cannon ball and a small pellet of paper; but by one o'clock the turmoil dies down, the rest of the hospital retires to its well-earned midday meal and subsequent leisure, and he is left to deal with the motley crowd who have been sent up to see the medical specialist, so that in lieu of other forms of recreation and refreshment he can turn now, with hope of being uninterrupted, to what may be termed his out-patient department.

In civilian life the services of a consultant or specialist are called upon for the consideration of some obscure condition upon which the general practitioner has expended some time and thought, and yet is in a state of uncertainty which leads him to desire some special investigation or advice. And there is no doubt that a similar principle should inspire the medical officer in charge of a battalion or other unit, but owing to certain regulations he is encouraged, and occasionally compelled, to hurl at the specialist a variety of cases which connote the very ABC of medicine.

In civil practice, of course, the doctor's bona fides are sufficiently certified by his qualifications; he is believed in all cases to have acted not only with the best of intentions, but to the best of his ability, and he is outside criticism.

But a medical officer in charge of a unit is always confronted with the fact that, reduced to fundamentals, his responsibility begins and ends with providing an ambulance for the removal of a case to hospital. It is sufficient that he transfers it, and no responsibility attaches to him as to its suitability or unsuitability for hospital treatment. It is an unfortunate corollary of this rule that should he

conscientiously examine and reflect upon his case, and it should subsequently turn out that through an error of judgment he has unlawfully detained a patient in quarters, he may be mercilessly criticized for acting outside his jurisdiction. There is no premium on hits, there is an overwhelming discount upon misses, and an officer who erred in a single case would not have credited to him his claim that he had accurately diagnosed a thousand previously. Where, then, mistakes are penalized and successes not approbated, it is small wonder, indeed, that he is soon persuaded to repudiate any sense of responsibility, and hastily to transfer it without delay to the shoulders of the few who become selected from their office to bear such responsibility.

Partly for this reason, and partly because of a refusal on the part of many invaliding boards to accept any opinion upon any sort of condition unless it is issued by a so-called expert, an extraordinary cult of "specialization" has sprung up, and the position of battalion medical officer, which affords exceptional opportunities for the observation of diseases in an early stage, tends in many cases to degenerate into a policy of *laissez-faire*, in which the officer merely selects some outstanding symptom and sends the patient straight off to the so-called specialist in the hospital.

And so one sees cases of albuminuria sent to the renal specialist, when a few minutes' examination and contemplation would have detected a gonorrhœal discharge. Has the man a pain in the back, he goes to the nerve specialist, and does he complain that he feels nervous or trembles, he must consult the neurotic specialist [*sic*]. Any reference to the chest brings him up to the chest specialist, who is therefore patronized by a remarkable potpourri, including indigestion, aneurysm, chronic bronchitis, muscular rheumatism, arterio-sclerosis, pleurisy, intercostal neuralgia, tabes, and a host of other things. But occasionally the chest pain is localized to the precordial region, and so the heart specialist must be consulted. This gentleman is usually prepared to encounter almost any condition other than a disease of the heart. You will readily understand, therefore, how an enormous preponderance of what, pathologically considered, is rubbish reaches the "medical specialist," and yet the delight of the game is that he must be ever on the *qui vive* lest he overlook some serious abnormality.

Coincidences in medicine are almost incredible, and in one evening I remember seeing a case of aneurysm sent up as myalgia, a case of pneumothorax as bronchitis, and a case of tabes with girdle pains as D.A.H.—pain in the region of the heart. And on another evening there arrived simultaneously a case of œsophageal carcinoma labelled "This man is always complaining," a case of gastric crises who presented himself as "gastritis," and one of Addison's disease as "abdominal pain."

And although I have said that the last thing one thinks about is the heart itself when a man comes up with so-called cardiac symptoms, yet I rode for an amusing fall by laying down this law to a visitor who came to see me at work one morning and who had the malicious pleasure of seeing, among the first four of such patients who walked into my consulting-room, three genuine organic cardiac cases.

I would have liked to devote a whole paper to this topic alone, but my restless

desire to be general compels me to restrict myself to a comparatively brief reference to some of the curious problems with which I have been confronted during an experience of about 9,000 cases sent up to see the medical specialist, who has to steer a clear course through the shoals of specialities; gastro-enterology, neurology, cardiology, and, considering what an urgently conscripted Army must be, even pædiatrics and geriatrics.

A few have stuck in my memory, and none more persistently than the man who bore a chit "This man has no teeth—for your examination and report, please." I returned him with a somewhat platitudinous report: "I have examined this man and fully agree with you that he has no teeth." In return I received a most abusive letter, but despite my really serious attempt subsequently to discover what it was the medical officer outside really meant or desired, I have never to this day found out. On the whole an attempt to be funny does not seem to pay; one never knows where eventually one's opinions may travel. In my early days in the Army I might have been inspired to return a man sent up with the request for a "thorough overhaul" with the gentle retort that "this is a hospital, not a garage," but whilst a personal friend may sympathize with such a witticism a stranger rarely does so, and is apt to ventilate what he takes to be a grievance.

A large number of cases are sent up on account of some fairly general and deeply rooted misconceptions. To some doctors pain in the back is always nephritis—the spirit of Doan's backache pills advertisement has filled their souls as those of the civilian population—whereas as a matter of fact genuine nephritis cases never complain of such a pain. Everything which seems to be referable to the heart is regarded as heart disease, more especially as a certain type of doctor can never dissociate grave organic disease from every patient who comes up with any sort of complaint.

And—would you credit it?—but I have been asked by one medical officer to diagnose the disease in a man who merely pointed out to him that he had papillæ on his tongue!

It is not for me to sit in judgment, but I must deprecate the mistakes arising from failure to perform any sort of examination. We all make mistakes from incomplete examinations, and we are all culpable, therefore, in greater or less degree; but one can really be excused the condemnation of those who never perform any examination whatever. I will not weary you with examples; I will give one instance only. An officer was sent to me for advice as to treatment of chronic dysentery. Two years previously he had been invalided from the East as dysentery on account of blood in his stools. Since then he had been before many boards, all of whom had referred him for a further period as his "dysentery" persisted. Yet not a single doctor had ever looked at his rectum, whereas as a matter of fact he had a large bulging mass of hæmorrhoids, and I do not suppose he had ever suffered from dysentery. But I do not mean to suggest that many battalion medical officers are of this careless or indifferent type. A large number clearly investigate their cases with a thoroughness which inspires one's extreme admiration when one realizes the difficulties under which they have to work. And it demands some art to give a satisfactory explanation to a cautious medical officer who has observed inequality

of the pulses or absence of knee-jerks and demands a reason which may be quite obscure. It requires more tact, if less art, to explain away an alleged condition such as a heart murmur, an extensor plantar response, or the report of a strange pathologist who has diagnosed eosinophilia, when the only explanation one can advance for the causation is that the condition is not present. But the enormous majority of cases sent up fall under three heads: "Is this man ill at all?" "What category is he fit for?" and, "Is his disability due to military service?"

According to the Yellow Press, a doctor who cannot tell when a man is ill is only fit to be hanged. As a matter of fact in very many cases nothing is more difficult, and a great part of one's day in a military hospital is spent in struggling perpetually to prove a negative.

In civil life, of course, the average man neither goes sick unnecessarily nor does he tend to exaggerate his disability. Save in those comparatively rare instances when owing to insurance mismanagement a man is better off sick than at work, illness means at least considerable discomfort and possibly serious hardship.

But in the Army an entirely different state of affairs is presented. Sickness means not only no disadvantage but positive advantages. A man may wish to evade the irksomeness of duty for a time, or even escape from military service altogether—remember, please, we are dealing with a conscript army. Hospital means for him a comfortable bed instead of a shake-down on the floor; warmth, good regular food with possible extras, the companionship of the fair sex, not only the ministering angels in every ward but charitable and indiscriminating visitors. With the exception of the trivial assistance he renders in the ward, the slacker is free all day from any sort of work, and he is provided with numerous amusements, recreations and entertainments. Is it any wonder that, mingled with the genuinely sick, a constant stream of would-be hospital patients converges upon the medical hospital? Hard as it may sound, every man who presents himself without obvious and unmistakable evidence of illness must be regarded as a potential humbug. I say this sounds uncharitable, but let me remind you that a camp of 100,000 men was drawn to a not inconsiderable extent during the second half of the war from conscripts, and very unwilling conscripts at that. In these circumstances it is certainly belittling the state of affairs to suppose the existence of 1,000 slackers of the type I have depicted. One thousand is only one per cent, a tiny enough figure when considered unit by unit, but an army in itself when concentrated upon one hospital. Is it any wonder that the medical officers who are compelled to judge the elements of this stream day after day have constantly to check a disposition which may be termed pardonable, to regard all symptoms as exaggerated and to develop a scepticism that the patient's motives for appearing before them are not to seek legitimate assistance or advice?

But here one is reminded that a medical hospital stands perpetually on the edge of a precipice, for to overlook a serious condition or refrain from admitting a patient whose subsequent troubles may be attributed to neglect will lead to the most devastating condemnation that an officer—and *a fortiori* a medical officer—can incur.

Pte. A. walked up to the hospital one morning with a complaint of indigestion and was passed to the medical specialist. When he arrived in my room, his temperature was 97·6° F., his pulse 84, and his abdomen moved perfectly. Yet something in his appearance, something quite undefinable, encouraged the belief that he was not very well and would be better for a few days in hospital. Providence, which watches over fools and the industrious, alone prevented that man being returned to his unit with half a dozen other dyspeptics with advice to his medical officer to give a placebo; for in six hours Pte. A. was on the table undergoing an operation for perforated gastric ulcer with general peritonitis.

Cpl. B. was sent up on December 26, complaining of abdominal derangements and volunteering the obvious explanation that the aftermath of Christmas festivities was responsible. But Providence again came into consultation, for Cpl. B. was suffering from acute intestinal obstruction from some long-standing abnormality, and Providence alone averted "another hospital scandal."

Pte. C.'s complaint was headache, the complaint of many hundreds of chronic loafers. Yet for some reason Pte. C. was put on one side for special investigation, and in less than half an hour he was dead, post-mortem examination revealing a cerebral tumour. And Pte. D. was sent up with this complimentary character from his Medical Officer: "This man is a well-known humbug who has got out of going overseas twice already, and has reported sick this morning when he was due to go on a draft. Will you support me if I charge him as a malingerer, please?" Appearances were therefore all against Pte. D., but he had after all signs of early pneumonia, and in two days he was indeed fighting for his life with double pneumonia, carrying in addition the handicap of a serious valvular lesion which up till then had been entirely overlooked!

There is of course the ever-present risk that a man may be sent from hospital and die from some condition that no human being could possibly have suspected or diagnosed in life, but the hospital will have to face the music. And I have even had to refute the preposterous charge of neglect because a man had died in his barracks and had *two months before* been seen at the hospital and not admitted for some chronic condition which could have had no sort of relation to his decease. But the uncharitable will always believe anything against a hospital, and any stick is good enough with which to beat us.

These examples are offered with no desire to extract sympathy for difficulties, but as an honest appeal for mercy on account of mistakes I have made.

As a matter of fact the genuine malingerer is rare. Our clientèle is largely supplied by the type of man who in civilian life was never able to maintain any sustained interest or exertion, who says that he is "not used to being 'urried," who was "used to a nice soft job which permitted him to stop when he liked, or take a day's holiday when he felt so disposed," who was told when a boy that he ought to take care of himself and means to fulfil that exhortation, and who comes up because he is "all of a tremble," or "gets a pain in his abdomen whenever a gun goes off," or who "gets a feeling of hot plates on his head and cold plates on his loins after he has walked a mile" or whose "heart is always coming into his mouth," or who has always got a pain somewhere or other, or faints, or has fits or giddiness unless he has a job in the cook-house.

To this type routine is abhorrent. The idea of being compelled to rise at a fixed

hour and perform duties unremittingly at regular times under inexorable supervision is sufficient to drive him to the happy release afforded by going sick, and to hospital he is sent, for there is no room in a unit for a man who is unfit for duty.

In the second place we meet the type which appeals more to our sympathy, the middle-aged conscript who does not easily assimilate to an entirely strange environment. Such men, who are aged about 45, look about 65 and behave as if they were 85, have a curious propensity to develop an asthenia which in civil life would lead one immediately to suspect the existence of some really serious organic disorder, but who baffle every attempt of investigation to discover any kind of lesion. One calls these cases "debility," a term rightly deprecated for its indefiniteness, yet after all what can you call them?

Somewhat akin to this category is that comprising men sent to the hospital by medical officers who mistake misery for illness. Of all ages and classes, these men are only affected with home-sickness or the results of brooding upon their change of station and the shipwreck of their future. It is manifest that medicine can do nothing for these. A sympathetic reception of his complaints and subsequent explanation occasionally reconciles such a man to his obligations as a citizen and a patriot, but generally the medical specialist is obliged to return a report that this man's symptoms will persist so long as he is in the Army.

And last of all is the man who is merely war-weary and whose symptoms once again appear to be the accompaniment of some grave disorder. Yet on almost innumerable occasions I have seen phenomenal improvement, with complete disappearance of apparently urgent symptoms and again in weight of perhaps twenty pounds, arise simply from the rest which a few weeks in hospital confer.

I have mentioned the word *malingerer*; it should be used with the very greatest reserve—one might almost say never—and woe betide the medical officer who advances such an accusation unless he is prepared to produce overwhelming proof when he is cross-examined by the barrack-lawyer at the subsequent court-martial. In this country we are fortunately spared the ingenious artificial diseases which our confrères on the other side of the Channel have studied with such care and are so brilliant in detecting. The disease par excellence for deliberate fraud as we encounter it is pulmonary tuberculosis. Knowledge of the familiar symptoms is readily acquired by the would-be false pneumopath, who is likewise familiar with the regulation that a man who is positively diagnosed is *ipso facto* invalided from the Service. From the mere interrogation of his medical officer he learns that pyrexia, weakness, wasting, night sweats and the spitting of blood are traditional expectations. And above all is he aware that identification of tubercle bacilli in his sputum will, notwithstanding the absence of all other signs and symptoms, secure him immediate discharge.

Now genuine hæmoptysis is frequently present without physical signs of any kind, so that the production of a bloody expectoration will, all other disease having been excluded, demand admission under a tuberculosis specialist for investigation. Yet the manufacture of a bloody sputum is one of the easiest possible things to a man who is bent on "working his ticket." Manipulation of the thermometer, moreover, requires no elaborate technique, and although more art is required to produce tubercle bacilli in the sputum, on more than one

occasion the surprising appearance of a large percentage of positive sputa in a ward of patients undergoing appropriate investigation has led to the suspicion and eventually the discovery that a known positive case has been obliging enough to distribute his sputum in the pots apportioned to the other patients, doubtless for a consideration. It becomes urgently necessary, therefore, that every case of suspected phthisis be rigidly investigated and his sputum examined only if it has been expectorated directly under supervision into a selected vessel. I may add, as an observation of some interest, that of a hundred patients sent up as suspected phthisis, often on the patient's own statements; about twenty pass the filter of the medical specialist as really suspicious enough to demand investigation, and of these twenty, half a dozen at most are eventually invalided from the Service as tuberculous.

The question of accurately categorizing a man needs very little discussion. It is a tempting compliment to the medical man to provide him with a variable number of classes into which he is supposed to drop any man whose capabilities he is required to grade. Now, quite apart from the question of individual opinion—for as we know quite well, in the case of so-called heart disease the same man may be classed A1 by one physician and C3 by another—nobody can possibly measure what in a large number of instances is the vital factor, the man's willingness to perform duties. It is often possible to say that a certain man is obviously incapable from his physical imperfections to indulge in any sort of exertion. I once had a case sent up to me who was aged 56, blind in one eye, almost stone deaf, had a large double hernia, flat feet and the symptoms of D.A.H., and it was not difficult to recommend the disposal of this walking museum. But what are you to say of the man who protests his inability to walk half a mile, although physical examination is entirely negative? To call him a liar may be grossly unjust; he may be compared to a motor car with a generally excellent chassis but a defective magneto. The plain fact is that whilst the method of ascertaining whether a man is fit or not for certain duties is obvious, the impracticability is equally obvious, for it necessitates trying him, and the cases which are clearly unfit for anything can be differentiated by a layman, let alone an expert physician. But the question of what diseases are due to or aggravated by military service is a much more attractive field for discussion. Once again we see the advantage that surgery has over medicine. A wound in action or a misadventure whilst in training are clearly due to military service. But when you have excluded dysentery and malaria and other tropical diseases which a man would not have acquired unless he had been sent on active service, you are left with the whole of medicine as an endless topic for this form of speculation.

The broad principle laid down seems childishly simple; can you say with confidence that the man would not have acquired this disease if he had remained a civilian? But of course you cannot, in practically every instance you cannot, for our knowledge of pathology is too inexact to define dogmatically what influence may or may not be added by the circumstances of military service. And we are asked to go even further and estimate from a man's present condition first of all what he must have been like at the time of enlistment, and next, what he would now be like had he never joined the Army. As an abstract problem it is all very amusing no doubt, for every case affords an endless opportunity for discussion.

I know one distinguished physician who holds that for social reasons venereal disease can be regarded as due to military service.

Recently I had an opportunity of debate upon this subject with a very eminent K.C., who proceeded judicially to expound at length how it ought to be quite easy in every case, for you took all circumstances into consideration; you found out what sort of life he led before he joined the Army and what particular duties he had performed during his military service, and what exposure he had endured, and so on. I listened to him with becoming respect and then retorted, 'just so, it is the very reasonableness of all you say which makes one angry. You are the very type who draws up for us questions to be answered categorically 'Yes or no,' and who reviles us in the witness-box when we attempt to give an explanation on these lines and caustically demands, 'A plain answer, please, and not a sermon.'"

A man dies of cancer of the stomach, of lymphadenoma, of pernicious anæmia, of chronic nephritis or of transverse myelitis. How can you determine exactly when such diseases originated? How can you evaluate the effect which military life has had upon if not their origin at least their aggravation? From one point of view the healthiness of military life ought to make a man less susceptible to respiratory diseases than the circumstances of civilian life, and yet it is at least arguable that to a man used to a warm, sheltered, if unhygienic home the exposure and relative overcrowding coupled with discomforts and home-sickness gave him a greater susceptibility. You will readily understand the difficulties in the way of decision as regards deaths in the recent influenza pandemic when the civilian as well as the military population were affected.

And there is just one other point in this connexion. Suppose a man requires invaliding after a few months' service for valvular disease of the heart which must certainly have been present for at least five years. He protests stoutly that he was *totus teres atque rotundus* when he enlisted, and supports his claim by the reminder that a doctor passed him in and that therefore his heart must have been perfectly sound. There is some reason in the patient's argument, yet are we called upon to make a second mistake because one has clearly been made? We are human beings, and in spite of a sense of duty sentiment plays its part. Not only does the patient or his relations get the benefit of the doubt, but frequently they get the benefit when there is no doubt.

I am coming towards the end of my paper, and I fear that I weary you with the number of details I try to include. But there is one special feature which I cannot neglect, and that is the matter of complaints directed against a hospital. Whether in civil or military life, a hospital seems *par excellence* the butt for the ill-directed venom of the agitator, but the scoundrel who loves to throw mud at an institution has the time of his life when the hospital is a military one, for it is under Government control and must be expected to deal officially with any charges which any Tom, Dick or Harry—or for that matter, any Jane, Sal or Harriet—may choose to bring against it.

It would hardly be profitable to deal at any length with what may be termed intrinsic complaints, charges brought against a hospital's administration by patients whilst actually enjoying its hospitality. The British soldier is proverbially a grouser, but speaking from admittedly a comparatively slight

experience of the regular, I do not hesitate to say that he has too good a sense of fairness and too well ingrained a sense of discipline to forget his responsibilities as a patient. Regular soldiers, who in a modern military medical hospital are as few as currants in a war-time pudding, are the greatest blessing, for not only by their example but by their determination to exact discipline their co-operation with medical officers is of inestimable value. But as I have had occasion elsewhere to point out, a not inconsiderable item in a conscript army is the loafer, and the worst elements of this class gravitate to hospital on the slightest provocation. Medical officers in charge of units would better understand the reluctance of hospital officers to admit these undesirables if they realized their remarkable contaminating influence upon a whole ward of men who only need the stimulus of a bad example entirely to alter their attitude to the hospital, the officers and the nursing staff. An example of laziness, of insolence and of chronic grumbling against the food and even the treatment, becomes far more infectious in a ward than any acute specific fever, and if any officer in charge of a unit in my audience may have been resentful at one time or another of my refusal to take in the chronic rheumatic, the chronic nervous dyspeptic and others of that type, I should like him now to receive my assurance that only too often have I been forced to suffer the unfortunate results which such an admission may entail.

But to turn to the more important external complaints. I have never quite understood why, but I do not hesitate to say that there exists in a certain section of the population a sort of antipathy, a rooted mistrust of hospitals in general, and they are regarded more or less as institutions where experiments are practised upon the unfortunate inmates entirely for the doctors' benefit. And such a prejudice is not entirely unknown among members of what may be termed the educated classes. It is not difficult, therefore, to find a band who are ready at all times to listen to any charge brought against a hospital, to believe in it and to convict the hospital without trial as a matter of course.

In war-time and when the hospital is a military one a charge is still more easily elaborated, for the Yellow Press and a certain type of politician eagerly welcome the opportunity to curry favour and condemn a Government institution unheard simply to be "agin the Government."

Now, it is far far easier to attack a medical than a surgical hospital, both from the character of the patients as a whole and from the nature of medical as opposed to surgical diseases. Speaking pretty generally, surgical conditions are not materially altered by the circumstance of the patient being khaki-clad. I mean that it is much the same thing in the Army as in civil life if a man has a broken leg, an acute abdominal condition, a hernia, or even flat feet. But medical diseases are so largely a matter of symptoms, and when signs are present there is often the greatest difference in the interpretation of these signs by different people. For both these reasons the patient who wishes to attack the treatment he has received or the official decision as to his capacity has always some sort of a hand to play. Should he complain of a chronic pain in the back, one has to form some judgment of his character and assess the degree of his disability mainly by one's belief in his veracity; and if to support his claim he brings certificates from medical men who in civilian life treated him for what he

calls "chronic rheumatism," he advances these as proof that the hospital specialist who sends him back to full duty is both a fool and a knave.

By the layman, and even the educated layman, the bewildering differences of opinion expressed by doctors will never be comprehended or reconciled. A man will protest that it is courting death for him to engage in the ordinary activity of an A1 man because he has serious heart disease, and as before, he will produce certificates from doctors who have interpreted some slight peculiarity in the sounds of the heart to indicate a grave condition and have not hesitated to put their opinions on paper. In the hospital cardiologist's view this peculiarity no more affects the working of the heart than the squeak of a spring in a motor car affects the efficiency of the engine. Yet the patient who prefers to believe himself a C3 man, will fight and demand board after board and even get his case taken up by an M.P., and finally brought before the military House of Lords before he will take his proper place in the ranks.

Furthermore, the patient having lost his case abandons weapons, which up till then have been legitimate if excessive, and out of sheer spitefulness proceeds to elaborate wholly fictitious charges. You would not believe me were I to describe the preposterous complaints which have occurred in my own experience; you would not believe that Members of Parliament and other prominent people would dream for a moment of supporting and assisting such charges to be brought to the notice of the War Office. Yet over and over again the most malicious charges of carelessness, wilful negligence and callous indifference to suffering, of ignorance and of brutality, charges not only against an officer's professional capacity but even against his honour, have to be met and denied categorically item by item with such proof as one can produce against a monstrous exaggeration or a deliberate lie.

I am not of course suggesting that complaints need not be investigated. It is best for an institution that the efficiency of its working should be subjected to supervision. But I do feel that something should be done to protect a hospital from the scandalous attacks which it is open for anybody to advance. It ought to be possible to insist that a heavy penalty awaits the slanderer if his charge is found to be wholly unwarranted or to be based upon evidence which he has not taken the trouble to investigate. With the present arrangement there is nothing to prevent anybody from throwing stones or flinging mud to his heart's content and enjoying all immunity from retaliation when the grossness of his action is thoroughly demonstrated.

I cannot leave this subject without another word upon specialization. I have deprecated the lengths to which this principle has extended, but there is this to be said for the Army specialist; that once he has become authoritatively recognized as an expert, his superiors support him through thick and thin with a whole-hearted confidence which is an embarrassing compliment. A patient may bear a sheaf of certificates from Sir Blunderbuss Bore and other titled leaders of the profession, but however much their opinions are respected they will not be unquestionably accepted until they are confirmed by the Army specialist. The latter may gravely reflect that his eminent colleagues were already well established in the hallowed Harley Street neighbourhood about the time when he was taking the air in his perambulator and anticipating promotion to his first pair of knickerbockers!

Finally, I would like to deal with a subject which is very near to my heart, professional relationship as it exists in the Army. I think I am right in saying that never in the history of our profession has so exceptional a disturbance arisen as that in the crisis through which we have recently passed. Owing to the admission of many thousands of practitioners to the rank of temporary officers it is inevitable that from time to time some curious anomalies of position have occurred which cannot have been anticipated and which could not have been prevented. The doctor becomes a temporary soldier, and however difficult it may be for him to remember that he is a soldier, it is far more difficult for him to forget his traditional privileges as a doctor.

A general practitioner of perhaps five and twenty years of highly successful practice finds himself in charge of patients to whom he naturally regards himself as responsible in much the same way as in his private work—for his diagnosis, his treatment and his disposal. It is with difficulty that the habit of years can be broken and that he can learn to realize that in practically no respect is he left an absolutely free hand, but that his judgment and opinion must be subjected to the criticism of his superior officer, who may be many years his junior.

His diagnosis must first of all stand the test of reference to official nomenclature, quite apart from any question of opinion as to its pathological correctness or incorrectness. The patient's dietary is strictly regulated by A.C.I., and in the addition of extras, although these are sanctioned to an apparently unlimited extent, in actual practice he must be prepared to defend the urgent necessity of any additions if, as not infrequently happens, his hospital is called upon to sustain the charge of extravagance. And even worse criticism awaits him in the matter of drugs; prescription of his favourite remedies may be rudely refused if their departure from orthodox hospital mixtures is not considered to be justified. Whilst even the disposal of his patient is no longer in his hands. Any tendency to prolonged stay in hospital must be checked owing to the demands which frequently arise for beds for urgent Expeditionary cases, and an order from headquarters to empty the hospital of every possible patient. All such restrictions will come most heavily upon the older men, partly because of a natural resentment towards interference of any kind and partly because, with the best of intentions on their part, long acquaintance with civilian patients unfits them for regarding the sick in a military hospital from an entirely different standpoint.

Now, in all these circumstances the divisional officer is the *deus ex machina*, and he is ever coming to grief in his attempt to steer a middle course between the Scylla of professional discourtesy and the Charybdis of incapacity to realize military exigencies. His failure to produce a large number of empty beds will call forth the wrath of his seniors who have issued an order which must be carried out. On the other hand, his purely impersonal action in exercising an official control may be misconstrued as the interference of a conceited young Jack-in-office.

It says much, very much, for the loyalty and good fellowship that have pervaded our profession in this crisis that all parties come to understand one another, to learn to give and take, and that very little friction results.

Nevertheless, the conscientious divisional officer can hardly hope ever to be a

popular man; and pessimistic though such a conclusion may sound, he must rest content if he earns the respect of those with whom he comes into intimate professional relationship; their affection he is hardly likely to gain. But he has his compensations; his position is a fine training ground, not only to learn his profession, but for the good of his soul, the education of his sense of proportion and development of the broadmindedness which results from a realization that there is method in other people's madness. In adjusting the complications which have arisen over somebody's unjustly awarded twopenny bus warrant, he will learn to forget (if he ever knew it) that *de minimis non curat lex*. Perhaps in the course of time he learns to curb his impatience and realize the stupidity of the irritation which springs up on hearing twenty times a day, in answer to the question "Of what do you complain?" "Well, I don't exactly know," or to a demand as to the duration of symptoms—"Oh, a long time," or "Since I came back from France." And, best of all, he may develop a sense of humour and come to share with poor Jack Point the belief that there is humour in all things and that when there is naught else to laugh at you can laugh at yourself. And he will laugh with that medical specialist who appreciated the well-earned rebuke of a patient who, in answer to a gruff attack upon his complaint of "gasteritis"—"Gastritis, what's that? I don't know what gastritis means," obliged with the gentle, totally unexpected information: "It means chronic inflammation, sir, of the lining of the alimentary canal!"

Review.

LICE AND THEIR MENACE TO MAN. By Lieutenant LL. Lloyd, R.A.M.C.(T).
London: Henry Frowde and Hodder and Stoughton. 1919. Pp. 136 + xii.
7s. 6d. net.

This book is intended for the general reader rather than for the specialist. With this in mind, one may consider it to give a very readable account of the louse problem in all its bearings, and especially as encountered and dealt with in the Army.

The life-history of the louse, and the means by which it is spread, are carefully described. An account of its behaviour to heat and chemicals follows. This gives the key to the means of combating lousiness, that is, of disinfection, by various methods, descriptions of which are given, together with useful illustrations of improvisable and inexpensive apparatus.

Chapter IX on relapsing fever, chapter X on typhus fever, and chapter XI, written by Major W. Byam, R.A.M.C., on trench fever, are of especial interest and importance.

There is also a very interesting chapter detailing experiments showing the unusual activity of lice when exposed to febrile temperatures, but it is regrettable that such a piece of important original work should be virtually buried in a book of this nature.

We should have been pleased to have found a chapter dealing with the Clayton method of obtaining sulphur dioxide for disinfection purposes, as sulphur has been largely employed by the British armies in the field, and, apart from this, is still in very general use.

The book as a whole is an informing and useful piece of work, but it is not sufficiently elaborate to be termed a technical text-book, and it is not sufficiently inexpensive for a popular one.

Correspondence.

MUCOID FORMS OF PARATYPHOID.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—Some time ago my attention was drawn to a paper on the above subject by Captain W. Fletcher, R.A.M.C., in the *Lancet*, July 27, 1918. Captain Fletcher found these "mucoid" growths on endo plates inoculated with an emulsion of excreta from paratyphoid carriers and he describes them as "large, slimy, white, mucilaginous colonies."

I should like to record briefly my own experience, though unfortunately I am debarred from referring to my notes.

In 1916, I recorded the case of a chronic paratyphoid carrier (*Bacillus paratyphosus* B), from whose excreta these "mucoid" colonies were obtained in large numbers on endo plates. The condition was so striking that I made a special note of it in my Annual Report of the Enteric Convalescent Depot, Naini Tal (Army Sanitary Reports, India, 1916). In my report I described these colonies as "gelatinoid," for lack of a term to describe the appearance of zooglæa formation which they conveyed. I was able repeatedly to confirm the observation that the organism was true *B. paratyphosus* B.

Again in 1918, I was making daily examinations of an officer who was a chronic carrier of *B. paratyphosus* B, and one day through stress of work put off the examination of the plate till the following day. Meanwhile the plate lay on my bench. The next day I found that several colonies showed a secondary "mucoid" growth round their edges, giving the appearance of tiny thickly tyred wheels. Mindful of my former experience I tested these and found them to be *B. paratyphosus* B. In this particular case the cultural peculiarity of the organism proved a great saving of labour as it was only necessary to leave the incubated plate for a further period of twenty-four hours at room temperature for the organism to demonstrate itself by its secondary growth. I never found in this particular case, though I controlled the observation many times, that any other organism showed the same peculiarity.

The only reference to a previous similar observation that Captain Fletcher could cite was a paper by Revis (*Cent. jair Bact.*, 1910, p. 26) on a similar cultural change in *B. coli*, and I am not aware of others.

Central Laboratory,
Baghdad,
June 7, 1919.

I am, yours faithfully,
J. C. KENNEDY,
Lieutenant-Colonel R.A.M.C.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

JULY, 1919.

EXTRACTS FROM THE "LONDON GAZETTE."

War Office,
May 14, 1919.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Warrant Officers, Non-Commissioned Officers and Men :—
363006 Staff-Serjt. W. T. Vickery, M.M., Royal Army Medical Corps (Hereford). (M.M. gazetted January 22, 1917.)

401178 Cpl. (Acting Serjt.) E. Hirst, D.C.M., M.M., 1st Field Ambulance, Royal Army Medical Corps (Barnsley). (M.M. gazetted June 18, 1917.)

36118 Pte. (Acting Lance-Cpl.) A. Holdridge, M.M., 51st Field Ambulance, Royal Army Medical Corps (Northwick).

6314 Cpl. J. Liddle, M.M., 17th Field Ambulance, Royal Army Medical Corps (Brixton). (M.M. gazetted July 9, 1917.)

49892 Cpl. (Acting Serjt.) W. Kirwin, M.M., 74th Field Ambulance, Royal Army Medical Corps (Oswaldtwistle). (M.M. gazetted August 16, 1917.)

68107 Serjt. J. H. Barton, M.M., 107th Field Ambulance, Royal Army Medical Corps (Canada). (M.M. gazetted November 2, 1917.)

417018 Serjt. J. W. Wagg, D.C.M., M.M., 1/1st Field Ambulance, Royal Army Medical Corps (Derby). (M.M. gazetted November 19, 1917.)

497261 Serjt. J. Gibson, M.M., 2/3rd Field Ambulance, Royal Army Medical Corps (Penzance). (M.M. gazetted December 12, 1917.)

25966 Pte. A. Charlton, M.M., 19th Field Ambulance, Royal Army Medical Corps (Little Hulton). (M.M. gazetted December 17, 1917.)

54771 Serjt. J. Anderson, M.M., 105th Field Ambulance, Royal Army Medical Corps (Gateshead-on-Tyne.)

90053 Serjt. (Acting Staff-Serjt.) F. J. Stevens, M.M., 106th Field Ambulance, Royal Army Medical Corps (Margate). (M.M. gazetted February 4, 1918.)

403491 Pte. C. Yates, M.M., 2/3rd Field Ambulance, Royal Army Medical Corps (Apperley Bridge). (M.M. gazetted March 13, 1919.)

30821 Pte. J. Startin, M.M., 28th Field Ambulance, Royal Army Medical Corps (Nuneaton). (M.M. gazetted August 29, 1918.)

55408 Pte. J. D. Anderson, M.M., Royal Army Medical Corps (South Shields). (M.M. gazetted October 7, 1918.)

401225 Pte. J. W. Braddick, M.M., 2/1st Field Ambulance, Royal Army Medical Corps (Morley). (M.M. gazetted December 11, 1918.)

33488 Pte. (Acting Lance-Cpl.) T. H. Twigg, M.M., 101st Field Ambulance, Royal Army Medical Corps (Birmingham). (M.M. gazetted in present Gazette.)

His Majesty the King has been graciously pleased to approve of the award of a Military Medal for Bravery in the Field to the undermentioned Warrant Officers, Non-commissioned Officers and Men :—

ROYAL ARMY MEDICAL CORPS.

34939 Serjt. G. Bailey, 133rd Field Ambulance (Builth Wells).

89717 Serjt. A. Ellis, 139th Field Ambulance (Watford).

37150 Serjt. A. Laing, 34th Field Ambulance (Glasgow).

40829 Serjt. (Acting Staff-Serjt.) J. R. Mackenzie, 51st Field Ambulance (York).
 27431 Serjt. H. S. Miller, 17th Field Ambulance (New Barnet).
 405051 Serjt. A. Pattison, 3rd Field Ambulance (Sheffield).
 318034 Serjt. R. Stevenson (Kelty).
 330276 Cpl. H. E. Baker, 1st Field Ambulance (Burnley).
 35104 Cpl. J. Baker (Scarborough) (Egypt).
 19098 Cpl. (Acting Serjt.) F. P. Burley, 5th Field Ambulance (Great Yarmouth).
 456016 Cpl. C. J. Fielden, 2nd Field Ambulance (Bristol).
 5691 Cpl. (Acting Serjt.) G. Gallagher, D.C.M., 16th Field Ambulance (Liverpool).
 48586 Cpl. T. J. Jones, 130th Field Ambulance (Pontypridd).
 17277 Cpl. (Acting Serjt.) R. N. Knowles, 17th Field Ambulance (Lancaster).
 301115 Cpl. (Acting Serjt.) G. C. Nicol, 1st Field Ambulance (Aberdeen).
 337050 Cpl. (Acting Serjt.) E. F. Rudge, 1st Field Ambulance (Liverpool).
 5611 Cpl. (Acting Serjt.) E. A. Swatten, 88th Field Ambulance (Bulford).
 58663 Cpl. (Acting Lance-Serjt.) W. Williams, 92nd Field Ambulance (Petworth).
 100632 Pte. G. S. Abbs, 92nd Field Ambulance (Bradford).
 435477 Pte. G. A. Allen, 1st Field Ambulance (Birmingham).
 35704 Pte. F. B. Anderson, 28th Field Ambulance (Burnley).
 8916 Pte. C. W. Archer, 6th Field Ambulance (Brixton).
 24046 Pte. M. Armstrong, 12th Field Ambulance (Seaton Delaval).
 72057 Pte. A. W. Ashton, 133rd Field Ambulance (Mereworth).
 72737 Pte. W. J. Bannister, 17th Field Ambulance (Watford).
 63888 Pte. (Acting Lance-Cpl.) W. Bailey, 106th Field Ambulance (Hollingsworth).
 7693 Pte. C. E. Berry (Long Itchington).
 32527 Pte. R. G. Beyer, 34th Field Ambulance (West Hartlepool).
 421054 Pte. (Acting Lance-Cpl.) H. Bill, 3rd Field Ambulance (Stafford).
 57201 Pte. S. J. Bowen, 99th Field Ambulance (Morristow).
 69903 Pte. A. H. Bridge, 92nd Field Ambulance (Ashton-under-Lyne).
 45829 Pte. T. H. W. Burleigh, 44th Field Ambulance (Kelso).
 339346 Pte. A. Challenor, 63rd Field Ambulance (London, S.W.).
 1722 Pte. A. H. Coles, 27th Field Ambulance (Leicester).
 74099 Pte. L. Coles, 138th Field Ambulance (Weston-super-Mare).
 66601 Pte. H. Cooke, 99th Field Ambulance (Birmingham).
 62844 Pte. D. S. Cordukes, 92nd Field Ambulance (York).
 6471 (Acting Cpl.) R. S. Corner, 17th Field Ambulance (Ipswich).
 66923 Pte. (Acting Cpl.) W. T. Dark, 140th Field Ambulance (Kidderminster).
 339359 Pte. J. E. Davies, 63rd Field Ambulance (Johnstown).
 49450 Pte. J. Gauld, 74th Field Ambulance (Dundee).
 100653 Pte. R. Gibson, 72nd Field Ambulance (Rowlands Hill).
 52266 Pte. G. Good, 107th Field Ambulance (Chorley).
 51846 Pte. F. J. Goodwin, 1st Field Ambulance (Borough, S.E.).
 43601 Pte. P. Grady, 133rd Field Ambulance (Newcastle-under-Lyne).
 54231 Pte. A. Greenwood, 92nd Field Ambulance (Nelson).
 40359 Pte. G. M. Gregson, 27th Field Ambulance (Southport).
 62773 Pte. (Acting Lance-Cpl.) W. W. Haley, 91st Field Ambulance (Leeds).
 8598 Pte. A. H. Harris, 74th Field Ambulance (Caerphilly).
 31143 Pte. H. G. Hayne, 51st Field Ambulance (Hornsey).
 57403 Pte. W. Holden, 44th Field Ambulance (Bolton).
 74126 Pte. F. A. Hooper, 139th Field Ambulance (Romsey).
 104934 Pte. O. Hudson, 139th Field Ambulance (Thackley).
 401001 Pte. T. W. Hunter, 1st Battalion (Bishop Auckland).
 88395 Pte. J. Hutton, 27th Field Ambulance (Leith).
 41364 Pte. T. Hutton, 4th Field Ambulance (Belfast).
 49096 Pte. E. Jones, 72nd Field Ambulance (Daw End).
 55661 Pte. (Acting Cpl.) T. Jones, 17th Field Ambulance (Troon).
 88391 Pte. J. Johnson, 27th Field Ambulance (Glasgow).
 27298 Pte. (Acting Serjt.) A. H. Kelly, 91st Field Ambulance (Stoke-on-Trent).
 300019 Pte. E. King, R.A.M.C. (Glasgow).
 461333 Pte. G. R. Lane, 3rd Field Ambulance (Midhurst).
 49895 Pte. H. Lager, 72nd Field Ambulance (Coalville).
 101794 Pte. B. Leach, 72nd Field Ambulance (Darwen).
 27272 Pte. T. L. Leblanc, 74th Field Ambulance (Stratford).
 66674 Pte. E. J. Lewis, 140th Field Ambulance (Bideford).
 10373 Pte. J. Lock, 3rd Field Ambulance (Bristol).
 350261 Pte. (Acting Lance-Cpl.) G. J. Mahoney, 1st Field Ambulance (Manchester).
 65397 Pte. A. E. Mead, 4th Field Ambulance (Chesham).
 88586 Pte. R. Miller, 28th Field Ambulance (Tottenham).
 31384 Pte. J. Morris, 27th Field Ambulance (Newburgh).
 350561 Pte. (Acting Lance-Cpl.) G. Nicholson, 1st Field Ambulance (Chiswick).

68322 Pte. F. Nightingdale, 189th Field Ambulance (Ennis).
 421294 Pte. (Acting Lance-Cpl.) T. Nuttall, 3rd Field Ambulance (Wolverhampton).
 339278 Pte. H. O'Neill, 63rd Field Ambulance (St. Helens).
 31779 Pte. H. Page, 27th Field Ambulance (Tillicoultry).
 1409 Pte. (Acting Cpl.) B. Mcn. Palmer, 17th Field Ambulance (Armley).
 81651 Pte. J. Reynolds, 16th Field Ambulance (Stirling).
 2095 Pte. P. J. Rudd, 17th Field Ambulance (Sunderland).
 74811 Pte. F. Scorey, 139th Field Ambulance (Gosport).
 53908 Pte. E. Shallcross, 3rd Field Ambulance (Birkenhead).
 92150 Pte. S. W. P. Simmonds, 3rd Field Ambulance (Hemel Hempstead).
 98110 Pte. J. Smith, 91st Field Ambulance (Norwich).
 75438 Pte. J. Smith, 101st Field Ambulance (Darfield).
 318218 Pte. T. Smith, 2nd Field Ambulance (Glasgow).
 10214 Pte. J. Sommerville, 3rd Field Ambulance (Peebles).
 37990 Pte. G. Stiles, 101st Field Ambulance (Catshill).
 25765 Pte. J. J. Sutch, 230th Field Ambulance (Easington Colliery).
 6369 Pte. E. Tappolet, 9th Field Ambulance (Stoke Newington).
 66309 Pte. W. J. Terry, 138th Field Ambulance (Canterbury).
 301145 Pte. J. Thom, 1st Field Ambulance (Aberdeen).
 708 Pte. W. Thomas, 1st Field Ambulance (Swansea).
 46864 Pte. H. W. Turnbull, 34th Field Ambulance (Newcastle-on-Tyne).
 33488 Pte. (Acting Lance-Corporal) T. H. Twigg, 101st Field Ambulance (Birmingham).
 31342 Pte. R. Tyrrell, 27th Field Ambulance (Irish Town).
 421081 Pte. B. Walker (Willenhall).
 3164 Pte. F. Waterfield, 4th Field Ambulance (Chatham).
 421060 Pte. (Acting Corporal) B. A. White, 3rd Field Ambulance (Wolverhampton).
 8440 Pte. R. Whyman, 34th Field Ambulance (Edinburgh).
 66510 Pte. W. Wills, 130th Field Ambulance (Newton Abbot).
 78694 Pte. S. G. Wilson, 35th Field Ambulance (South Shields).
 105155 Pte. J. H. Wright, 35th Field Ambulance (Leeds).

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Man for gallantry in the performance of Military duty:—
 54793 Pte. O. Berry, Royal Army Medical Corps, 62nd General Hospital (Stalybridge), Italy.

AMENDMENTS

The following is the correct description of the undermentioned Non-commissioned Officer, whose name has recently appeared in the *London Gazette* for the award of the Military and Meritorious Service Medal:—

Meritorious Service Medals. *London Gazette*, dated January 18, 1919.—40446 Serjt. (Acting Company Serjt.-Major) G. W. Benham, Headquarters, 19th Division, Royal Army Medical Corps.

War Office,
 May 17, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY HIS MAJESTY THE KING OF ITALY.

Silver Medal for Valour.

Capt. John Edwin Allan, M.B., Royal Army Medical Corps (Special Reserve).
 Capt. William Eidinow, Royal Army Medical Corps (Special Reserve).

Bronze Medal for Valour.

Temp. Capt. Francis James Alphonsus Keane, M.D., Royal Army Medical Corps.
 Temp. Capt. John Tryweryn Lloyd, M.C., M.B., Royal Army Medical Corps.
 Capt. (Acting Major) George Reginald Edward Gray Mackay, M.C., M.B., Royal Army Medical Corps (Territorial Force).

Croce di Guerra.

Lieut.-Col. (Temp. Col.) Samuel Arthur Archer, C.M.G., Royal Army Medical Corps.
 Temp. Capt. Henry Edward Montgomery Baylis, M.B., Royal Army Medical Corps.
 Capt. (Acting Lieut.-Col.) Ralph Alexander Broderick, D.S.O., M.C., M.B., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. James Miller Christie, M.B., F.R.C.S., Royal Army Medical Corps.
 Temp. Capt. Ambrose Emerson, M.D., Royal Army Medical Corps.
 Capt. (Acting Major) Thomas Douglas Inch, O.B.E., M.C., M.B., Royal Army Medical Corps.

Capt. Robert Leech Newell, M.B., Royal Army Medical Corps (Special Reserve).
 Lieut.-Col. (Temp. Col.) Ransom Pickard, C.M.G., M.B., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. John Patrick Shaw, M.C., Royal Army Medical Corps.
 Capt. Oskar Teichmann, D.S.O., M.C., Royal Army Medical Corps (Territorial Force Reserve).
 Captain (Acting Major) Treffry Owen Thompson, M.B., Royal Army Medical Corps.
 20654 Pte. John Cassell, 22nd Field Ambulance, Royal Army Medical Corps (St. Helens, Lancs).
 1998 Pte. Ernest Patrick, D.C.M., MM, 22nd Field Ambulance, Royal Army Medical Corps (New Wortley, Leeds).
 43296 Pte. William Tomalin, 22nd Field Ambulance, Royal Army Medical Corps (Stoke Newington, N.).
 8310 Corporal Jabez Webster, D.C.M., 22nd Field Ambulance, Royal Army Medical Corps (Mansfield, Notts).

DECORATIONS CONFERRED BY HIS MAJESTY THE EMPEROR OF JAPAN.

Order of the Rising Sun, 4th Class.

Col. William Robert Smith, Royal Army Medical Corps (Territorial Force).

War Office,
 May 26, 1919.

His Majesty the King has been graciously pleased to approve of the following awards to the undermentioned Officers, Warrant Officers, and Non-commissioned Officers in recognition of their gallantry and devotion to duty in the Field :—

AWARDED THE DISTINGUISHED SERVICE ORDER.

Capt. Heerajee Jehargir Manockjee Cursetjee, M.B., Indian Medical Service attached 14th Sikhs (Mesopotamia).

For conspicuous gallantry and devotion to duty at Mushaq, October 26-27, 1918, and at Sharqat, October 29. Throughout the operations he displayed the greatest zeal and disregard for danger while tending the wounded under heavy fire, working unceasingly for forty-eight hours. He has previously rendered excellent service, and once was severely wounded.

AWARDED THE MILITARY CROSS.

Capt. John George Bennett, M.B., Royal Army Medical Corps, attached 20th Brigade, R.F.A. (Mesopotamia).

For conspicuous gallantry and devotion to duty at Mushaq, October 26, 1918. He worked day and night in the open under heavy fire, tending the wounded and superintending their evacuation. His energy and disregard of danger throughout were admirable.

Second Class Senior Sub-Assistant Surgeon Khagwan-Singh, I.O.M., Indian Medical Department (Mesopotamia).

For conspicuous gallantry and devotion to duty at Sherqat on October 29, 1918. When the regimental aid-post came under heavy fire, he displayed the utmost coolness in appeasing the wounded and alleviating their sufferings. Throughout the action his conduct was a fine example to his subordinates.

Capt. Maurice Dwyer, Royal Army Medical Corps, Special Reserve (Mesopotamia).

For conspicuous gallantry and devotion to duty on October 29-30, 1918, at Sherqat. He displayed great disregard of danger during an attack on the enemy's position. He remained all day and night exposed to heavy fire, searching for and dressing the wounded. In the dark he made his way forward to the firing line to see if his services were required, and stayed there attending to and superintending the evacuation of the wounded.

Capt. Harold Jacques, Royal Army Medical Corps (Mesopotamia).

For conspicuous gallantry and devotion to duty at the Leaser Zab on October 25, 1918. When the artillery brigade to which he was attached was in action he displayed great disregard of danger in attending the wounded under heavy fire. Four battery wagons were exploded by shell fire, but he continued to work in close proximity, rendering most valuable assistance until all cases were successfully evacuated.

War Office.
 May 27, 1919.

His Majesty the King has been graciously pleased to approve of the following immediate awards for conspicuous gallantry and devotion to duty in North Russia, conferred by Major-Gen. W. E. Ironside, C.M.G., D.S.O., in pursuance of the powers vested in him by His Majesty.

AWARDED A BAR TO THE MILITARY CROSS.

Temp. Capt. John Dalglish Watson, M.C., M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in evacuation of wounded from Toulgas during the period November 12-14, 1918, under fire and through drift ice with a panic-stricken crew on the river steamer. (M.C. gazetted January, 1918.)

AWARDED THE MILITARY CROSS.

Lieut. John Peter, Royal Army Medical Corps, Special Reserve, attached 17th Battalion, Liverpool Regiment.

For gallantry and devotion to duty during the attack on enemy positions near Kodish on February 7, 1919. Under heavy fire he attended to the wounded and placed them on sleighs. It was largely due to his fine conduct that the wounded were promptly evacuated and many lives saved.

Capt. (Acting Major) Frank Mortimer Taylor, Royal Army Medical Corps, Special Reserve.

For conspicuous gallantry and devotion to duty on December 30, 1918, at Kodish when he urged his sleigh drivers into Kodish through severe fire. He thus established a dressing station, collecting and tending the wounded under difficult and dangerous conditions.

War Office,
June 17, 1919.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Warrant Officers, Non-commissioned Officers, and Men :—

BAR TO THE MILITARY MEDAL.

66717 Pte. B. F. Marsh, M.M., Royal Army Medical Corps (Bristol). (M.M. gazetted December 9, 1916.)

45476 Pte. J. Paterson, M.M., 16th Field Ambulance, Royal Army Medical Corps (Watford). (M.M. gazetted January 6, 1917.)

1415 Pte. (Acting Serjt.) W. R. Prior, M.M., 5th Field Ambulance, Royal Army Medical Corps (Walthamstow). (M.M. gazetted April 17, 1917.)

40234 Pte. A. L. Thomson, M.M., 8th Field Ambulance, Royal Army Medical Corps (Edinburgh). (M.M. gazetted July 18, 1917.)

45404 Pte. (Lance Cpl.) W. J. Gibson, M.M., 108th Field Ambulance, Royal Army Medical Corps (Tandragee). (M.M. gazetted August 16, 1917.)

419404 Pte. R. E. Johnson, M.M., 2nd Field Ambulance, Royal Army Medical Corps, Territorial Force (Leicester). (M.M. gazetted August 21, 1917.)

51766 Pte J. Wood, M.M., 19th Field Ambulance, Royal Army Medical Corps (Manchester). (M.M. gazetted December 17, 1917.)

714 Pte. (Acting Cpl.) W. Parry, M.M., 16th Field Ambulance, Royal Army Medical Corps (Troedyrhiw). (M.M. gazetted February 23, 1918.)

54658 Pte. J. Savage, M.M., 110th Field Ambulance, Royal Army Medical Corps (Oswaldtwistle). (M.M. gazetted March 13, 1918.)

56221 Pte. W. H. Fisher, M.M., 1st Field Ambulance, Royal Army Medical Corps (Birmingham). (M.M. gazetted February 11, 1919.)

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for Bravery in the Field to the undermentioned Warrant Officers, Non-commissioned Officers and Men :—

ROYAL ARMY MEDICAL CORPS.

390017 Temp. Serjt.-Major H. M. Brown, 3rd Northumberland Field Ambulance (Hull).

461174 Qmr.-Serjt. (Acting Serjt.-Major) W. H. Teatum, 26th Field Ambulance (Southampton).

9484 Serjt. W. Butler, 109th Field Ambulance (Boston).

350163 Serjt. G. Clarke, 1st East Lancashire Field Ambulance (Manchester).

48066 Serjt. E. H. Evans, 130th Field Ambulance (Mountain Ash).

73519 Serjt. J. J. Fishwick, 76th Field Ambulance (Dalmuir).

390016 Serjt. F. H. Fry, 3rd Northumberland Field Ambulance (Hull).

403420 Serjt. A. Fuguel, 2nd West Riding Field Ambulance (Norton-on-Tees).

395038 Serjt. M. Hailey, 2nd North Midland Field Ambulance (Hull).

63912 Serjt. (Acting Staff-Serjt.) D. Jeffreys, 91st Field Ambulance (Ystradgynlais).

388039 Serjt. S. Liddell, 2nd West Riding Field Ambulance (Darlington).

350049 Serjt. R. Scowcroft, 1st East Lancs. Field Ambulance (Bradshaw).

72274 Sjt. F. G. Unwin, 134th Field Ambulance (Mersea).

39167 Sjt. E. G. Wilding 52nd Field Ambulance Kentish (Town, N.W.).

439014 Cpl. L. T. Avent, 3rd Northumberland Field Ambulance (Bristol).

2037 Cpl. B. Goulding, 16th Field Ambulance (Cork).

65597 Cpl. J. P. Harrison, 103rd Field Ambulance (Duston).

417041 Cpl. J. J. G. Hunt, 1st North Midland Field Ambulance (Derby).

31388 Cpl. T. A. Luck, 28th Field Ambulance (Brymbo).

390027 Cpl. (Acting Serjt. G. Milner, 3rd Northumberland Field Ambulance (Hull).

301024 Cpl. (Acting Serjt.) D. A. J. Neare (1st High Field Ambulance (Aberdeen).

388295 Cpl. W. Ridley, 2nd Northumberland Field Ambulance (Durham).

21925 Cpl. J. Roe, 101st Field Ambulance (Lees, Yorks).

27089 Cpl. (Acting Serjt.) C. H. Smith, 96th Field Ambulance (Battersea, S.W.).

504007 Cpl. H. C. Stent, 65th West Lancs. Field Ambulance (Ashford). †

28891 Cpl. G. Walley, 130th Field Ambulance (Obesterton).

388423 Cpl. (Acting Serjt.) A. J. Wilson, 2nd Field Ambulance (Bishop Auckland).
 64653 Pte. F. Aked, 100th Field Ambulance (Halifax).
 89021 Pte. G. H. Arthur, 5th Ambulance (Gateshead).
 63713 Pte. M. Atherton, 105th Field Ambulance (Atherton).
 68767 Pte. J. Atkinson, 95th Field Ambulance (Burnley).
 53361 Pte. H. Baillie, 108th Field Ambulance (Belfast).
 858 Pte. A. L. Baker, 56th Field Ambulance (Birmingham).
 303179 Pte. G. Barclay, 28th Field Ambulance (Wartle).
 352336 Pte. J. Bethel, 2nd East Lancs. Field Ambulance (Manchester).
 72602 Pte. J. Bodsworth, 104th Field Ambulance (Northampton).
 106231 Pte. G. W. Brawn, 28th Field Ambulance (Wollaston).
 352195 Pte. (Acting Serjt.) J. Briggs, 2nd E. Lancs. Field Ambulance (Burnley).
 22889 Pte. H. Brooks, 9th Field Ambulance (Fenton).
 47044 Pte. A. Burgess, 77th Field Ambulance (Farnworth).
 40944 Pte. (Lance-Cpl.) R. Caven, 108th Field Ambulance (Downpatrick).
 337661 Pte. M. B. Chenery, 87th Field Ambulance (Clapham Common, S.W.).
 78007 Pte. C. K. Child, 16th Field Ambulance (Linslade).
 48098 Pte. W. E. Coleman, 130th Field Ambulance (Crumlin).
 388395 Pte. T. B. Connolly, 2nd Northumberland Field Ambulance (Dunston-on-Tyne).
 80763 Pte. W. H. Coombs, 1st North Midland Field Ambulance (Canterbury).
 47108 Pte. J. Cooper, 110th Field Ambulance (Belfast).
 303421 Pte. G. O. Craib, 89th Field Ambulance (Aberdeen).
 341506 Pte. E. L. Cunliffe, 65th Field Ambulance (St. Helens).
 390559 Pte. (Lance-Cpl.) J. Dalby, 3rd Northumberland Field Ambulance (Hull).
 39030 Pte. J. Davis, 77th Field Ambulance (Oldham).
 81510 Pte. J. Drummond, 4th Field Ambulance (Lambeth).
 56102 Pte. A. Duncan, 55th Field Ambulance (Glasgow).
 8183 Pte. H. Earnshaw, 4th Field Ambulance (Colne).
 103653 Pte. E. Ellis, 106th Field Ambulance (Honley).
 41533 Pte. W. Ellis, 52nd Ambulance (Bolton).
 3371 Pte. A. Farrow, 3rd Field Ambulance (Tilbury).
 48768 Pte. (Lance-Cpl.) F. L. Findlow, 131st Field Ambulance (Macclesfield).
 57591 Pte. W. Flanagan, 1st Field Ambulance (Dublin).
 352401 Pte. L. Francis, 2nd E. Lancs. Field Ambulance (Ruabon).
 350250 Pte. R. Freeman, 1st E. Lancs. Field Ambulance (Preston).
 72248 Pte. W. J. Gallagher, 134th Field Ambulance (Londonderry).
 19441 Pte. (Acting Serjt.) H. Gates, 9th Field Ambulance (High Wycombe).
 435096 Pte. H. George, 56th Field Ambulance (Birmingham).
 388397 Pte. R. Gettings, 2nd Northumberland Field Ambulance (Dunston-on-Tyne).
 68801 Pte. W. Gilford, 106th Field Ambulance (Bodenham).
 46787 Pte. (Acting Cpl.) W. V. Gordon, 110th Field Ambulance (Clones).
 64135 Pte. F. Graydon, 111th Field Ambulance (Halifax).
 43122 Pte. (Lance-Cpl.) A. E. Green, 139th Field Ambulance (Camberwell).
 390509 Pte. E. Greenham, 3rd Northumberland Field Ambulance (Hull).
 30242 Pte. I. Guppy, 52nd Field Ambulance (Milverton).
 405169 Pte. J. Hague, 1st West Riding Field Ambulance (Sheffield).
 403575 Pte. K. C. Haigh, 2nd West Riding Field Ambulance (Leeds).
 63543 Pte. W. Hall, 75th Field Ambulance (Dartford).
 72411 Pte. A. W. Hargood, 103rd Field Ambulance (Wealdstone).
 20474 Pte. Harvey L., 12th Field Ambulance (Lowestoft).
 350479 Pte. H. Hillaby, 1st East Lancs. Field Ambulance (Manchester).
 405451 Pte. J. H. Hilliam, 3rd West Riding Field Ambulance (Leeds).
 63690 Pte. B. S. Hines, 105th Field Ambulance (Buckland).
 352157 Pte. J. E. Holden, 3rd Northumberland Field Ambulance (Moston).
 75995 Pte. C. Holmes, 135th Field Ambulance (Queen's Park, W.).
 9513 Pte. J. W. Hoodless, 75th Field Ambulance (Carlisle).
 66505 Pte. F. W. House, 100th Field Ambulance (Porchester).
 57033 Pte. H. E. Hughes (Shipton-on-Stour).
 74755 Pte. J. Hunt, 109th Field Ambulance (Leamington).
 72502 Pte. E. A. Ingram, 15th Field Ambulance (Northampton).
 3529 Pte. J. Jamieson, 76th Field Ambulance (Glasgow).
 7075 Pte. H. Jenkins, 76th Field Ambulance (Birmingham).
 41265 Pte. A. Kennedy, 108th Field Ambulance (Belfast).
 403134 Pte. W. Kirby, 2nd West Riding Field Ambulance (Leeds).
 50502 Pte. J. D. Knowles, 16th Field Ambulance (Leith).
 388506 Pte. A. Lennard, 2nd Northumberland Field Ambulance (Gateshead-on-Tyne).
 63698 Pte. A. Lingard, 105th Field Ambulance (Sheffield).
 405039 Pte. J. E. Lockington, 3rd West Riding Field Ambulance (Sheffield).
 50588 Pte. J. McFarlane, 3rd Field Ambulance (Paisley).

- 39373 Pte. J. M. McInnes, 1st Field Ambulance (Keslo).
 75061 Pte. D. McLeod, 13th Field Ambulance (Stornoway).
 41568 Pte. A. Moores, 52nd Field Ambulance (Bolton).
 775 Pte. M. Murphy, 2nd Field Ambulance (Dublin).
 354057 Pte. A. O'Rourke, 3rd (East Lancs.) Field Ambulance (Manchester).
 493269 Pte. G. J. Pearce, 1st (H. C.) Field Ambulance (Maidstone).
 403634 Pte. L. V. Pckett, 1st West Riding Field Ambulance (Bradford).
 388537 Pte. A. Pickering, 2nd Northumberland Field Ambulance Gateshead-on-Tyne.
 65674 Pte. N. Poole, 103rd Field Ambulance (Bradford).
 1068 Pte. (Acting Cpl.) J. W. Price, 6th Field Ambulance (Wood Green).
 7754 Pte. (Acting Serjt.) A. W. Reast, 2nd Field Ambulance (Kensington).
 405485 Pte. A. H. Richards, 3rd (West Riding) Field Ambulance (Nottingham).
 48179 Pte. J. Richards, 130th Field Ambulance (E.) (Cardiff).
 20623 Pte. T. L. Rimmington, 2nd Field Ambulance (Bedford).
 38287 Pte. T. Rogerson, 54th Field Ambulance (Bolton).
 53403 Pte. D. Scoular, 54th Field Ambulance (Broxbourne).
 106175 Pte. H. Settle, 38th Field Ambulance (Liscard).
 81337 Pte. J. Sharman, 108th Field Ambulance (Nottingham).
 77024 Pte. C. A. Sharp (York).
 71952 Pte. G. E. Shea, 138th Field Ambulance (Luton).
 98419 Pte. F. W. Sherrin, 54th Field Ambulance (Willesden, N.W.).
 42824 Pte. A. R. Sim, 134th Field Ambulance (Aberdeen).
 3447 Pte. J. Skelsey, 2nd Field Ambulance (Frankton).
 7496 Pte. A. F. Skinner, 2nd Field Ambulance (Wortwell).
 417446 Pte. (Lance-Cpl.) S. Smales, 1st (N. Mid.) Field Ambulance (Worsop).
 37365 Pte. D. Smart, 55th Field Ambulance (Cowdenbeath).
 17810 Pte. F. J. Smitters, 16th Field Ambulance (Streatham Common, S.W.).
 72426 Pte. (Acting Cpl.) W. J. Taylor (Stambridge).
 4975 Pte. J. Towland, 16th Field Ambulance (Glasgow).
 1821 Pte. E. Turvey, 109th Field Ambulance (Skerton).
 101364 Pte. T. Walker, 110th Field Ambulance (Rochdale).
 43570 Pte. T. Walters, 16th Field Ambulance (Liverpool).
 2864 Pte. A. Waugh (Longton).
 43782 Pte. W. D. Way, 18th Field Ambulance (Golder's Green, N.W.).
 405445 Pte. R. Welsh 1st (West Riding) Field Ambulance (Leeds).
 12513 Pte. (Lance-Cpl.) A. H. West, 90th Field Ambulance (Stedham).
 27040 Pte. W. Williams, 5th Field Ambulance (Milford Haven).
 53733 Pte. H. Wilson, 138th Field Ambulance (Belfast).
 62290 Pte. G. F. Windybank 113th Field Ambulance (Witley).
 75941 Pte. A. R. Wood, 55th Field Ambulance (Leytonstone).
 401038 Pte. G. H. Wood 1st (West Riding) Field Ambulance (Rawdon).

AMENDMENTS.

The following are the correct descriptions of the undermentioned Non-commissioned Officers and Men, whose names have recently appeared in the *London Gazette* for the award of the Military and Meritorious Service Medal :—

Military Medal.

London Gazette, dated December 12, 1917: 316496 Serjt. J. B. Gemmill, 47th Field Ambulance, Royal Army Medical Corps.

London Gazette, dated February 11, 1919: 318164 Pte. E. Hutton, 2nd Field Ambulance, Royal Army Medical Corps.

London Gazette, dated March 13, 1919: 538042 Pte. (Acting Lance-Cpl.) J. Hill, 6th Field Ambulance, Royal Army Medical Corps.

The amendment in the *London Gazette*, dated March 13, 1919, should read 42231 Pte. J. Janes, Royal Army Medical Corps (previously shown as James).

AUXILIARY ROYAL ARMY MEDICAL CORPS FUND.

THE usual Quarterly Committee Meeting was held on Friday, July 4, at 11, Chandos Street, Cavendish Square, W.1. Twelve grants were made to cases in the Benevolent Branch for Officers, amounting to £898, and two grants in the Relief Branch for the rank and file, amounting to £86.

These funds are for the relief of widows and orphans of commissioned officers and men of the rank and file of the Royal Army Medical Corps, Special Reserve, Territorial Force and New Armies, and also for the relief of the children of those who have been

so severely damaged in the present war that they need help for the education of children. Requests for relief should be addressed to the Hon. Secretary, Sir William Hale-White, at the Offices of the Funds, at 11, Chandos Street, Cavendish Square, W.1.

ROYAL ARMY MEDICAL COLLEGE,
GROSVENOR ROAD, S.W.1.,
June 12, 1919.

DEAR SIR,—A proposal has been put forward to amalgamate the United Services Medical Society with a new section of the Royal Society of Medicine which is about to be formed.

The advantages of this proposed amalgamation are given in the attached letter.

An alternative suggestion is that the United Services Medical Society should continue as an independent body, its sessions being devoted for the most part to discussions on administrative problems peculiar to the Navy, Army and Air Forces, the new Section of the Royal Society of Medicine taking for its sphere the more definitely professional aspects of Naval, Military and Air Force Medical and Surgical subjects.

It is pointed out that the annual subscription of the present United Services Medical Society would remain at five shillings a year if the Society continues. In the event of the majority deciding in favour of amalgamation, the subscription of all those who wished to be members of the new Section of the Royal Society of Medicine would be one guinea a year.

It has been decided to get the opinion of all officers as to whether they are in favour of this amalgamation or of the alternative suggestion that the two organizations should exist independently.

S. GUISE MOORES,
Major-General, A.M.S.,
President, United Services Medical Society.

THE ROYAL SOCIETY OF MEDICINE,
1, WIMPOLE STREET, W.,
June 6, 1919.

To the Hon. Secretaries of the United Services Medical Society.

GENTLEMEN,—At a Conference held here to-day between the representatives of your Society and of this, it was agreed that this Society should make a definite proposal to yours with a view to its amalgamation with the newly formed Section established for the purpose of dealing with all subjects affecting Naval, Military and Air Medicine and Surgery.

The offer of this Society is briefly as follows: If your Society is in favour of such amalgamation and dissolves, all your members who apply to be enrolled, will be enrolled as members of the new Section without election or payment of the usual admission fee of two guineas, but they will pay the annual subscription of one guinea. As members of the new Section they will be entitled to receive free by post each month the *Proceedings* of the Section, to attend all meetings of the Section, and to hold office and take part in the management of the Section. They would further be entitled, upon payment of the Library Subscription, to have the fullest use of the Society's Library of over 100,000 volumes, and if living out of London to receive parcels of books from the Library carriage free.

It may be mentioned also that although not as a right, they would as a matter of fact with very rare exceptions, be able to attend the meetings of all other Sections.

We may mention that in the case of the other societies which amalgamated with this in 1907, upon dissolution they handed over whatever funds, books or other property they possessed to this Society, which thereby made itself responsible for the discharge of all liabilities, but this would be a matter for the members of your Society freely to discuss and decide for themselves.

We are, faithfully yours,

H. D. ROLLESTON,	President.	
H. S. PENDLEBURY,		} Hon.
W. S. PASTEUR,		
C. H. FAGGE,		} Hon.
J. CHARLTON BRISCOE,		
R. W. MACALISTER,	Secretary.	

MEMORANDUM AS TO THE APPOINTMENT OF PATHOLOGIST AND BACTERIOLOGIST FOR PUBLIC HEALTH DEPARTMENT, AUCKLAND, NEW ZEALAND.

(1) A **QUALIFIED** specialist in Pathological and Bacteriological work is required for the Public Health Department, Auckland. Appointment is subject to the Public Service Act, Professional Division, Class A.

(2) The salary will be seven hundred pounds sterling (£700) per annum.

(3) The appointment will probably be permanent. Three months' notice will be required in writing, on either side, to determine the engagement.

(4) The candidate selected for the appointment will be given first-class passage if single. If married a sum of £140 towards passages will be allowed, but travelling in steerage is prohibited. Passage money to be refunded by the officer if he voluntarily resigns within two years.

(5) Half salary will be paid to the selected candidate from date of embarkation until he takes up his duties in New Zealand.

(6) No residence will be provided nor any allowance in lieu thereof. Travelling expenses are paid in accordance with ruling scale in New Zealand when travelling on the service of his Department.

(7) The officer appointed must devote the whole of his time to the work of his department. He will not be permitted to take private pupils nor to engage in tuition nor any other professional pursuit.

(8) He will be, in all things, subject to the direction and regulations laid down by the New Zealand Government.

(9) In the event of the officer being guilty of conduct unbecoming his position, or being unable to discharge the duties of the office, or wilfully neglecting to observe the terms of his agreement, the engagement may be terminated forthwith.

(10) The High Commissioner for New Zealand will make the appointment on behalf of the New Zealand Government, and the candidate selected must leave for New Zealand within a reasonable time of being appointed.

(11) The candidate selected will require to submit himself for medical examination as to the state of his health before being appointed.

(12) Applications from candidates in the United Kingdom are to be made on the enclosed form in triplicate, and addressed to the High Commissioner for New Zealand, 415, Strand, London, W.C.2. and must reach the High Commissioner's Office not later than August 1, 1919.

June, 1919.

INFORMATION FOR CANDIDATES FOR APPOINTMENTS IN THE DEPARTMENT OF MEDICINE, UNIVERSITY OF OTAGO, DUNEDIN.

The Council of the University of Otago invites applications for the following appointments:—

(a) **A Professor of Systematic Medicine.**

(b) **A Professor of Clinical Medicine and Therapeutics.**

(c) **A Lecturer on Clinical Medicine.**

(1) **Duties.**—(a) The Professor of Systematic Medicine will be required to give a course of lectures on Systematic Medicine, and devote an average of ten hours per week to clinical instruction in the hospital. The following restrictions will be placed upon his private practice: He will not be allowed to undertake surgical cases, nor midwifery cases, nor any club practice.

(b) The Professor of Clinical Medicine and Therapeutics will be required to give a course of lectures on Materia Medica, Therapeutics, and Treatment. He will also be required to devote an average of ten hours per week to clinical instruction in the hospital. The following restrictions will be placed upon his private practice: He will not be allowed to take any club practice, and his private practice must not interfere with his University work.

(c) The Lecturer on Clinical Medicine shall also act as Medical Tutor and Clinical Registrar. He will be required to give clinical instruction at the bedside in the hospital,

and also in the Out-patient Department to an average amount of ten hours per week. His private practice must be restricted so as not to interfere with his University work.

(2) *Salary*.—The salary attached to position (a) is £600 per annum, to position (b) £500 per annum, and to position (c) £400 per annum. Each salary will commence from February 1, 1920, provided the successful applicant reports his arrival in Dunedin by that date. If he arrives in Dunedin after February 1, the salary will commence from the date on which he reports his arrival. The successful applicant for each position will be required to subscribe to the Teachers' Superannuation Fund, involving a deduction from salary. The deduction is five per cent if the applicant, on joining the Fund, is not more than 30 years of age, six per cent if he is not more than 35, and seven per cent if he is not more than 40.

(3) *Time of Arrival*.—It is desirable that each of the appointees should reach Dunedin by the first day of February, 1920.

(4) *Tenure*.—The appointment in each case will be for five years, and after that time the engagement may be terminated by six months' notice on either side.

It does not necessarily follow that the engagement will terminate at the end of the period mentioned; it was some time ago resolved by the University Council to limit the tenure of all appointments to Professorial Chairs to the term of five years, so as to allow of such changes or modifications as the interests of the University or of Higher Education may hereafter show to be necessary.

(5) *Applications*.—Candidates must forward their applications to the Hon. the High Commissioner for New Zealand, Strand, London, W.C., so as to reach him not later than August 16, 1919. The application form must be filled in in quintuplicate, and must be accompanied by twenty copies of testimonials. Every candidate should prefix to each set of testimonials a copy of his letter of application, and also the tabulated information given on the application form.

NOTE.—Applicants in New Zealand and Australia will apply direct to the Registrar, University of Otago; applications to be in his hands by August 30, 1919.

(6) *Medical Certificate*.—With the application there must be sent a medical certificate of sound health.

(7) *Passage Money*.—If the successful applicant is resident in Great Britain or Ireland the Council will allow him the sum of £104 for passage money. If he is resident elsewhere, the Council will pay on his behalf the value of a first-class passage from his place of residence to Dunedin.

(8) *Age Limit*.—It is improbable that a candidate will be appointed who is less than 30 or much more than 40 years of age.

(9) *Mode of Appointment*.—The British candidates will be reported on by a Board of Advisers presided over by the High Commissioner, but the final appointment will be made by the Council of the University of Otago.

(10) *Agreement*.—Each of the successful candidates will be required to sign an agreement with the Council of the University of Otago. If the selected candidate is resident in Great Britain or Ireland, the High Commissioner for New Zealand will act for the Council. If he is resident in New Zealand or Australia, the agreement will be forwarded to him for his signature.

(11) *General*.—The University of Otago is one of the four teaching institutions affiliated to the University of New Zealand, and prepares students for the degrees of this University. The three other affiliated Colleges are Canterbury College, Auckland University College and Victoria College (Wellington). The University of Otago has connected with it the only Medical School in New Zealand, a Mining School, a Dental School, and a School of Home Science, besides the ordinary Arts and Science Departments. The teachers of the affiliated Colleges are well represented on the governing body of the University of New Zealand.

In 1918 the total number of students attending the University of Otago was 662, of whom 225 belonged to the Medical Faculty. During the current year 750 students are in attendance, and of these 255 are medical students.

Booklets descriptive of the Course have been forwarded to the High Commissioner.

MEMORIAL TO THE LATE SURG.-GENERAL SIR WILLIAM TAYLOR, K.C.B.

THE Committee regret the delay through unavoidable circumstances in reporting to the subscribers the result of their decision as to the most suitable form of memorial to be adopted. A sum of £87 10s. Od. was collected. It was decided to erect a Tablet in St. George's Church, Aldershot, in which there are many memorials to officers of the Corps. An excellent site has been sanctioned and the work has been completed.

The Memorial was designed and executed by Messrs. Ramsden and Carr, of St. Dunstan's, S. Kensington, and is a handsome specimen of their artistic work. It is of hand chiselled



antique brass enclosed in moulding and mounted on oak. The upper portion is divided into three boldly modelled panels, displaying in the centre the old badge of the Army Medical Staff with laurel sprays. The side panels display the Star of the Order of the Bath and the Star of the Order of St. John and Jerusalem. Below is the panel containing the inscription in sharp raised letters. A photograph of the tablet is being sent to each subscriber. The Committee consider it a worthy Memorial to the esteem with which the late Sir William Taylor was held by all members of the Royal Army Medical Corps and by his friends.

List of Subscribers:—

Lieut.-Generals Sir Wm. Battie, Sir John Goodwin, Sir Launcelotte Gubbins, Sir Alfred Keogh and Sir Thomas O'Donnell.

Major-Generals A. P. Blenkinsop, Sir George Bourke, Sir Wm. Donovan, the late P. M. Ellis, Sir Thos. Gallwey, Sir Jas. Murray Irwin, S. Macdonald, Sir Jas. Maher, Sir Wm. Pike, R. H. Quill, Sir Michael Russell, Sir Henry Thompson, Sir Hayward Whitehead.

Colonels T. B. Beach, the late W. Beattie, A. E. J. Croly, A. Dodd, W. Lewis Gray, B. J. Inness, I. W. Caton Jones, A. G. Kay, Sir Wm. Crooke Lawless, W. Allan May, L. T. Nash, E. North, D. M. O'Callaghan, D. O'Sullivan, W. Rutledge, C. R. Tyrrell, D. Wardrop, C. A. Webb, R. J. Windle.

Lieut.-Colonels W. G. Clements, T. A. Dixon, I. Donnet, W. S. Dowman, A. L. Josling, I. M. Macdonachie, W. A. Morris, R. H. Nicholson, W. Hooper-Pinches, G. E. Weston, E. M. Wilson.

Majors R. W. H. Jackson, Conway.

Captain W. I. Spencer.

The following friends were also subscribers to the Memorial:—

General Sir Ian Hamilton, Lieut.-Gen. Sir Reginald Pole-Carew, Sir John Furley, Surgeon-General G. F. A. Harris, I.M.S., Lieut.-Col. Alex. Grubb, Mr. W. I. Fieldhouse, Mr. E. F. Fieldhouse, Mrs. Fieldhouse, Miss Fieldhouse and Miss Sumner.

C. R. TYRRELL,
Hon. Secretary.

July 8th, 1919.

R.A.M.C. MEMORIAL AT ALDERSHOT.

The Monument here was unveiled by the late King, and a stone has been placed on the grass slope in front of it stating the fact. The granite is similar to that of which the column is made.



ROYAL ARMY MEDICAL CORPS CENTRAL MESS FUND.

Summary of the Proceedings of the Annual General Meeting of Subscribers to this Fund which was held at the Royal Army Medical College on June 11, 1919.

Lieut.-Gen. Sir John Goodwin, K.C.B., C.M.G., D.S.O., K.H.S.,
Director General in the Chair.

(1) The Minutes of the previous Annual General Meeting were read and confirmed.

(2) The Accounts for the years 1917-18 and 1918-19 were examined and, on the proposal of the Chairman, adopted unanimously.

(3) The Reports for the same years having been submitted, some questions arose thereon. Sir H. N. Thompson regretted that the proportion (about twenty per cent) of officers appointed to the Corps since the outbreak of the war who subscribed to the Fund was so small, and asked whether subscription to it could not be made compulsory on all officers joining the Corps. Lieut.-Col. F. S. Irvine thought that this was more due to ignorance than to lack of *esprit de corps*, and that when more normal conditions were re-established, the College was open, and the messes were full, these omissions would be made good. The Hon. Secretary said that notices explaining the objects of the Fund and banker's orders had been sent out, more than once, to all officers who had joined in the last five years, but that a large number of these had been returned "unknown," owing no doubt to the frequent change of unit. He added that it was held by the General Meeting at which the Fund was started that subscription to it could not be made compulsory, though it was hoped that the response would be general. At present rather less than three-quarters of the officers of the Corps subscribed to it, as against about four-fifths before the war.

The Chairman thought that a compulsory subscription was not practicable, but that when, under more settled conditions, the matter was brought to the notice of young officers on their joining the Corps there would be no difficulty in getting them to subscribe to the Fund, especially as it was to their financial advantage to do so. This appeared to be the general feeling of the meeting, and the matter dropped.

Major-Gen. Carr said that he found the mess at Netley very much the worse for wear, and asked whether help could be given to it from the Central Fund. The Hon. Secretary said that a considerable sum had accumulated in the Fund during the war, and that no doubt the Committee would do their best to meet from it any claims put forward by messes to make good the wear and tear of recent years.

The Reports were then adopted *nem. con.*

(4) On the proposal of Sir William Macpherson, seconded by Major-Gen. Guise Moores, it was resolved that Major G. E. Buckley be asked to act as auditor for the current year.

(5) Of recent years this Committee has been made up of one representative from each district and smaller Command, Aldershot and London having two each. Districts having now ceased to exist, the Committee had given careful consideration to its reconstruction. It was of opinion that one member from each Command in the United Kingdom, and from the London district, together with one from each of the following messes—London, Aldershot, Netley, Woolwich, Cosham, and Curragh—should constitute a Committee thoroughly representative of the Corps, and therefore recommended that this provisional scheme be adopted for one year; the representation of the Indian Messes remaining as at present, viz., one member each for Bangalore, Lucknow, Peshawar and Rawal Pindi.

This proposal met with general approval at once, and, on the motion of Sir William Babbie, seconded by Colonel Pilcher, was carried unanimously.

(6) Before the War the acquirement by the Central Fund of some, or all, of the Rawal Pindi Mess Debentures was under consideration, as it was thought that not only the Mess, but also the Fund would in the end benefit thereby. The Committee asked for authority to take action in the matter, should the members of that Mess still wish it, and further investigation show that it is desirable.

Lieut.-Col. W. Benson, a past Hon. Secretary of that Mess, explained the situation fully, as it was before the War, but had not yet received a reply to recent inquiry on the matter. After some discussion by officers who had been at Rawal Pindi in recent years, it was proposed by Sir William Macpherson, seconded by Sir H. N. Thompson, and carried unanimously, that the Committee communicate further with the Rawal Pindi Mess and report fully at the next General Meeting.

(7) Lieut.-Col. S. F. Irvine, speaking as Chairman of the Central Mess Committee, moved that a vote of thanks be accorded to the Hon. Secretary for his work in connexion with the Fund; this was seconded by the Chairman of the meeting, and carried unanimously.

J. T. CLAPHAM,
*Captain,
Hon. Sec.*

3, Homefield Road,
Wimbledon.

ROYAL ARMY MEDICAL CORPS FUND.

The Seventeenth Annual General Meeting of the Royal Army Medical Corps Fund was held at the Royal Army Medical Corps College on June 11, 1919, with the Director-General (Lieut.-Gen. T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S.) in the Chair. A large number of officers were present.

(1) On opening the proceedings the Director-General said he had no doubt that the meeting would like a brief account of the progress of the Fund during the War.

(i) *Officers' Branch.*—The investments have increased from £2,865 in 1914 to £5,851 7s. 11d. This is due of course partly to the fact that we have had no Dinner and also no expenditure on memorials. At the Annual General Meeting last year it was decided to have a special portrait of Sir Alfred Keogh painted with the Insignia of the Grand Cross of the Bath, and also a portrait of Sir Arthur Sloggett. These commissions have been carried out, and I am sure all officers who have seen the portraits will be satisfied with the excellent results obtained.

A Memorial is also in progress to commemorate certain officers who were specially distinguished in the unification of the Army Medical Services and the formation of the Royal Army Medical Corps, and I hope it will shortly be completed and placed in the College Mess.

(ii) *Numbers.*—After four years of continuous war we cannot be surprised that the number of subscribers has somewhat diminished. In 1913 we had 1,116; in 1914 we had 1,114; in 1915 we had 1,096; in 1916 we had 984; in 1917 we had 824.

These figures show the heavy losses we have sustained by death, but on the other hand, a large number of officers who have recently been granted commissions have joined, and the number of members at the end of 1918 amounted to 1047. Circular letters have been sent to all officers recently gazetted, and we have already had favourable responses from many, so that no doubt by the end of the present year we shall have more than regained our former position.

(iii) *Band.*—The Band has struggled gallantly along throughout the War in spite of losing nearly all its best musicians in drafts.

Small grants have been made from time to time as required, and I feel sure that if the Band Committee want additional assistance this year they have only to ask for it.

(iv) *General Relief and Schools.*—The investments in the General Relief Branch have increased from £1,600 in 1914 to £7,246 1s. 3d. at the end of last year, while the separate Fund for the education of children has gradually diminished to about £151, but by a Resolution passed at the Annual General Meeting last year the principle was approved that the education of children shall be taken over by the General Relief Branch when the School Fund is exhausted, subject to the financial position of the Fund at any future time. The calls for assistance by the General Relief Branch had been very small during the War, so that after paying all the usual subscriptions and a special donation to the Union Jack Club this year, a considerable amount has been invested.

If therefore any officers present know of cases of distress existing among the families of the rank and file, and of children in need of education, they are requested to bring them to the notice of the Secretary.

During the War it was impossible for officers to know much about the affairs of their men on account of the constant changes, but as we hope we are now getting back to more settled conditions, we should like to help any of our comrades who may have fallen on evil days.

(v) It may interest members who have not been able to attend the meetings for some years that we have divided the accounts of the Fund into two separate Branches, the Officers' Branch and that for General Relief and Schools, and also printed a booklet of the Fund with a description of its objects and Rules.

(2) The Secretary read the Report for the year 1918 as follows:—

REPORT OF THE COMMITTEE FOR THE YEAR 1918.

OFFICERS' BRANCH.

(i) The number of annual subscribers has increased from 824 in 1917 to 1,047. Nearly all the young officers who have recently received commissions have joined in response to notices sent to them after the gazettes had been published, and replies are still coming in.

(ii) The income amounted to £1,422 1s. 3d., including dividends from investments and refund of a proportion of office expenses for the year 1917 from the Benevolent Society and the General Relief Branch, and as the expenditure continued to be small £800 has been invested in National War Bonds 5 per cent 1928 series.

(iii) There was no dinner last year and no expenditure on memorials.

(iv) Grants amounting to £180 were made to the Band.

(v) A grant of £30 was made to the widow of a deceased officer under the special circumstances referred to in Rule 5.

GENERAL RELIEF BRANCH.

(vi) Grants and subscriptions from Companies and Units abroad were received to the amount of £1,062 13s. 2d., and as the applications for assistance were few in number a further sum of £2,100 was invested in National War Bonds 5 per cent 1928 series.

The annual subscription to the Union Jack Club and other Societies have been paid and also a proportion of the office expenses for 1917, amounting to £62 ls. 8d. to the Officers' Branch.

COMPASSIONATE SCHOOL FUND.

(vii) Grants have been made to the Royal School for Daughters of Soldiers at Hampstead, to the Royal Drummond Institute at Dublin, and to the Home for Destitute Catholic Children. There still remains in this sub-branch a sum of £159 10s. 6d.

GENERAL.

(viii) The book of the Rules which was approved by the Annual General Meeting last year has been printed and copies distributed to all subscribers and to the principal Messes and Hospitals at home.

(3) The Report was adopted and the audited accounts for the year 1918 were considered and approved.

(4) It was proposed by Major-Gen. Sir W. Donovan and seconded by Col. H. W. Murray that a grant of £25 be made from the Officers' Branch to the General Relief Branch.—Carried.

(5) The accounts of the Band were very fully discussed. At the present time the expenditure of the Band was £50 per quarter and up to May 31, there was £42 18s. 5d. in hand.

Capt. Allnutt and Col. Irvine gave their views very fully; £200 would be required for a year, which was exclusive of the extra expenditure to replace instruments lost during the War.

The last grant they had received was £60 in March. After further discussion it was proposed by Lieut.-Col. A. B. Cottell and seconded by Major-Gen. Browne, that a sum not exceeding £350 be devoted to the purposes of the Band up to the end of the current year, this to be exclusive of the £60 already voted.—Carried.

(6) The action taken under Rule 5 for a special grant to the widow of a deceased officer was explained, and it was proposed by Lieut.-Col. G. E. Twiss and seconded by Sir G. D. Bourke that the action be approved.—Carried.

(7) The question of voting a grant from the Officers' Branch to the Fund for a special memorial to the Royal Army Medical Corps who had fallen during the War was next considered. The Director-General said that he did not know the views of the meeting as to the advisability of making a grant to the General Memorial Fund for the Royal Army Medical Corps.

The question as to the form the memorial was to take had not yet been settled. Views had been received from every Command and at the next General Meeting these varying views would be placed before the special committee for decision, but whatever form the memorial was to take, one thing was certain and that was that a permanent memorial of some description to members of the Royal Army Medical Corps who had fallen in the War should be instituted. Some thousands of pounds had already been received and he hoped a good deal more would come to hand.

After discussion it was proposed by Major-Gen. Sir W. G. Macpherson and seconded by Col. C. K. Morgan that the question of voting a grant from the Officers' Branch to the General Memorial Fund for deceased officers and other ranks of the Royal Army Medical Corps be postponed until the next Annual Meeting.—Carried.

(8) It was proposed by Gen. S. G. Moores and seconded by Lieut.-Col. A. B. Cottrell that the present auditors, Messrs. Evans and Peirson, be re-elected.—Carried.

(9) It was proposed by Major-Gen. Sir W. G. Macpherson and seconded by Gen. Carr that Lieut.-Col. E. M. Wilson be re-elected as Secretary for one year.—Unanimously carried.

PROCEEDINGS OF A COMMITTEE MEETING HELD AT ADASTRAL HOUSE, WAR OFFICE, ON JULY 17, 1919.

Present.

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General, in the Chair.

Major-Gen. Sir G. B. Stanistreet, K.B.E., C.B., C.M.G., Deputy Director-General.

Major-Gen. Sir W. Donovan, K.C.B.

Major-Gen. S. G. Moores, C.B., C.M.G.

Col. Sir James Magill, K.C.B.

Lieut.-Col. A. B. Cottell.

Major P. G. Easton, D.S.O.

Major E. P. Offord.

Capt E. B. Allnutt, M.C., Band President.

(1) The minutes of the meeting held on April 10 and of the special meeting in connexion with the Annual Dinner held on April 22 were read and after some discussion confirmed.

(2) *Dinner.*—The Secretary reported that owing to a misapprehension a meeting of the Dinner Sub-Committee had not been called, and that it appeared that their accounts are usually balanced at the end of the year and submitted at a meeting held in February, when the question of the next Dinner is considered. The bills connected with the Dinner had, however, been paid,

and the Hon. Secretary of the Dinner Sub-Committee asked for a further grant of £10 as the separate Fund for the Royal Army Medical Corps Dinner was slightly in debt. This was approved.

The total amount paid by the Royal Army Medical Corps Fund, Officers' Branch, for the Dinner was £709 2s. 6d.

(3) *Memorials*.—The Secretary reported that the Memorials Sub-Committee had again inspected the design for the memorial to officers specially distinguished in connexion with the unification of the Army Medical Services and formation of the Royal Army Medical Corps and were well satisfied with it.

The plaster cast of the design is now finished, and the artist, Mr. W. R. Colton, R.A. proposed to send it to be cast in bronze immediately. He hoped that it would be finished in two or three months.

(4) The Secretary further reported that in all probability the cash balance of the Officers' Branch would not be sufficient to meet the amount already voted by the Annual General Meeting held on June 10, 1918, for this memorial, and the Committee gave authority to the Trustees to sell a portion of the £800 National War Bonds 1928 not exceeding £300 to meet this and other necessary expenditure during the present year.

(5) An application was considered from the Hon. Secretary of the Royal Army Medical Corps Memorial Fund for officers and other ranks of all branches of the Corps who have fallen during the War regarding certain postal and other expenses which he had made personally when arranging the memorial service at St. Paul's.

Sanction was given for the payment of £2 9s. 4d., but it was proposed by Sir W. Donovan, and seconded by Lieut.-Col. A. B. Cottell, that this amount should be recovered from the Royal Army Medical Corps Memorial Fund for the War.

(6) *Band*.—The accounts for the quarter ending June 30 were submitted showing a balance in hand of £125. No further grant is therefore necessary at present.

It was proposed by Capt. Allnutt (Band President) and seconded by Major Easton that the salary of the Bandmaster should be increased from £120 to £150 a year and that the War Bonus should cease. This to take effect as from July 1, 1919. Carried.

(7) *General Relief*.—The Secretary reported small grants which had been made in urgent cases under Rule 9:—

Mr. H. N.	..	..	..	£2
Mrs. R. B.	..	..	..	3
Mrs. L. E. S.	..	..	..	1

—
£6 Approved.

(8) (i) The case of Mrs. L. E. S. was further considered under Rule 8 on the question of the Fund guaranteeing payment for her admission as a resident to the Whiteley Homes, and it was proposed by Lieut.-Col. A. B. Cottell and seconded by Sir W. Donovan that authority be given to the Secretary to expend up to the limit permitted by the Rule, viz., £11, and to make a further report in due course. Carried.

(ii) A further grant of £3 was authorized for Mrs. R. B.

(9) Donations were reported from Col. J. F. O'Carroll, £10 10s.; Convalescent Hospital at Hollywood, Belfast, on closing, by Lieut.-Col. J. R. Buchanan, £200; also that the sum of £18 8s. 2d. is being recovered as rebate of Income Duty.

(10) The Secretary reported action he had taken in connexion with investment into the new Funding Loan in consequence of the short time the Loan remained open and the necessity for immediate decision.

After consultation with Mr. Holt and Sir W. Donovan, the sum of £800 has been invested to purchase £1,000 of the new Funding Loan, and the necessary papers will be signed by the Trustees in due course. Action approved.

(11) Mr. Holt as one of the Trustees suggested that the National War Bonds held by this Branch amounting to £2,800 might be converted into the new Funding Loan. The matter was submitted to the other Trustees, Sir W. Donovan and Col. D. Wardrop, and it was decided that no special advantage would be gained by the transaction. Action approved.

ROYAL ARMY MEDICAL CORPS OFFICERS' BENEVOLENT SOCIETY.

The Annual General Meeting of the Royal Army Medical Corps Officers' Benevolent Society was held at the Royal Army Medical Corps College on June 11, 1919, with the Director-General Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., in the Chair.

There was a full attendance of members.

(1) The Minutes of the last Annual General Meeting held on June 10, 1918, were read and confirmed.

(2) The Report of the Committee for the year 1918 was considered as follows:—

REPORT OF THE COMMITTEE FOR THE YEAR 1918.

(a) The number of subscribers for the year has increased from 181 in 1917 to 291, principally in consequence of the appeal sent out by the Committee in February last year, and a considerable number of additional officers have joined from the commencement of the present year. The amount of subscriptions received in 1918 was £316 19s. 6d. against £184 18s. 6d. in 1917.

(b) Donations were received from:—

Lieut.-Col. G. B. Riddick	£25	0	0
Officers' Mess, Canterbury (on closing)	20	0	0
Lieut.-Col. S. Bolyan Smith	5	0	0
Lieut.-Col. W. R. Galwey	2	0	0
Lieut.-Col. H. S. Anderson	5	0	0
Executors to the estate of the late Major W. A. Ward	3	3	0
	£60	3	0

(c) The total receipts amounted to £1,409 18s., as against £846 7s. 2d. in 1917.

(d) The sum of £200 has been invested in National War Bonds five per cent, 1928.

(e) The total actual expenditure deducting the purchase of National War Bonds, and an amount transferred to the Auxiliary Royal Army Medical Corps Fund was £920 7s. 9d.

(f) Twenty-nine applicants representing fifty-eight orphans were granted £850.

(3) The Report was approved and the audited statement of accounts for the year 1918 were examined and passed.

(4) On consideration of the grants to orphans recommended by the Committee the Secretary said in reply to the Director-General that if the grants recommended, amounting to £785, were approved, he estimated that after receipt of the Refund of Income Tax for 1918 and the Dividends payable during the second half of the year, there would probably remain a credit balance of nearly £600 at the end of the year. Also that by the Rules of the Society whatever sum remained unexpended must be invested. Major-General Sir W. G. Macpherson was of opinion that where there was a large sum of money which had not been expended. In cases of real distress, we should give a bigger grant to those cases instead of investing.

The Secretary intimated that under the Rules the limit which could be granted to any one family during a year was £40.

After very full and varied discussion it was proposed by Sir W. Donovan and seconded by Sir W. Babbie that in Rule 4 of the Regulations the words £40 be altered to £60.—Carried.

The effect of this Resolution is that the maximum grant issuable to any one family during any one year is increased from £40 to £60.

(5) The grants recommended by the Committee were then approved and it was further proposed by Major-General Sir W. G. Macpherson and seconded by Lieut.-Col. G. E. Twiss that the next Committee Meeting in July should consider the grants, especially the smaller grants which had already been given, with a view to increasing them proportionately under the powers conferred by the foregoing resolution, taking each case on its merits.—Carried.

(6) It was proposed by Col. H. W. Murray and seconded by Sir W. Babbie that a grant of £25 should be made to the orphan of the late R. T. O. Another case was considered but refused.

(7) It was proposed by Col. Pilcher and seconded by Major-Gen. Sir H. N. Thompson that the following officers be elected Vice-Presidents for the ensuing year:—

Lieut.-Gen. Sir W. Babbie, V.C., K.C.B., K.C.M.G.

Major-Gen. Sir W. M. Russell, K.C.M.G., C.B.

Col. Sir W. H. Horrocks, K.C.M.G., C.B.—Carried.

(8) It was proposed by Major-Gen. Sir W. G. Macpherson and seconded by Col. Pilcher that Col. C. K. Morgan, C.M.G., be elected to serve on the Committee vice Sir W. Horrocks appointed Vice-President.

(9) It was proposed by the Director-General and carried unanimously that the remainder of the Committee be re-elected—also that Messrs. Evans and Peirson be re-elected as auditors.

(10) Lieut.-Col. E. M. Wilson was re-elected as Secretary for one year.

(11) The amounts voted to orphans indicated by initials are attached.

LIST OF GRANTS AUTHORIZED TO ORPHANS AT THE ANNUAL GENERAL
MEETING ON JUNE 11, 1919.

Orphan of E. W. B. (including grant in advance)	£40	Orphan of T. S.	£10
Orphan of T. B. (including grant in advance)	40	Orphan of A. S.	20
Three orphans of C. C.	40	Orphan of C. S.	20
Orphan of R. A. C.	40	Two orphans of V. H. S.	30
Orphan of J. W. C.	25	Two orphans of R. C. T.	20
Orphan of R. G. H.	20	Orphan of A. T.	30
Four orphans of W. S. H.	40	Seven orphans of J. W.	30
Orphan of C. J. H.	20	Three orphans of C. W. D. (including grant in advance)	25
Orphan of W. F. F. I.	40	Seven orphans of W. H.	40
Orphan of J. McC. C.	20	Orphan of J. F.	30
Three orphans of T. McC. C.	40	Orphan of H. P. E.	20
Two orphans of R. D. O'C.	20	Three orphans of W. T. H.	30
Orphan of J. O.	40	Two orphans of K. M. C.	20
Two orphans of F. M. O. (including grant in advance)	30	Orphan of H. H. S.	20
Orphan of C. Q.	30	Orphan of R. T. O.	25
		Fifty-eight orphans received £855 ..	£855

PROCEEDINGS OF A COMMITTEE MEETING HELD AT ADASTRAL HOUSE, WAR OFFICE,
ON JULY 17, 1919.

Present.

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General, in the chair.

Lieut.-Gen. Sir W. Babbie, V.C., K.C.B., K.C.M.G.

Major-Gen. Sir W. Donovan, K.C.B.

Major-Gen. Sir David Bruce, K.C.B.

Major-Gen. Sir M. W. Russell, K.C.M.G., C.B.

Col. C. K. Morgan, C.M.G.

Lieut.-Col. A. B. Cottell.

Capt. J. T. Clapham.

(1) The minutes of the last meeting, held on April 10, were read and confirmed.

(2) The lists of grants to orphans recommended by the Committee at its meeting on April 10, and approved by the Annual General Meeting on June 11, were reconsidered in accordance with the resolutions of the Annual General Meeting (paras. 4 and 5 of the Proceedings), and additional grants authorized to the amount of £340. Each case was taken on its merits and all the circumstances carefully reviewed. A list of the additional grants is attached, the recipients being distinguished by the initials of the father.

(3) A new case, the orphan of W. G., was considered, and a special grant authorized of £20.

(4) It was proposed by Sir W. Babbie, and carried unanimously, that the Secretary should take action in the cases of certain of the orphans in receipt of grants who are prevented from earning their own livelihood by permanent ill-health, with a view to obtain compassionate allowances from the Ministry of Pensions.

LIST OF ADDITIONAL GRANTS AUTHORIZED BY COMMITTEE MEETING, JULY 17,
1919, IN ACCORDANCE WITH RESOLUTION OF ANNUAL GENERAL MEETING,
JUNE 11, 1919, PARAS. 4 AND 5.

Orphan of E. W. B.	£10	0	0	Two orphans of V. H. S.	£10	0	0
Orphan of T. B.	10	0	0	Orphan of A. T.	20	0	0
Three orphans of G. C.	10	0	0	Seven orphans of W. H.	20	0	0
Orphan of R. A. C.	10	0	0	Orphan of J. F.	10	0	0
Orphan of J. W. C.	20	0	0	Orphan of H. P. E.	10	0	0
Orphan of C. J. H.	10	0	0	Three orphans of W. T. H.	20	0	0
Orphan of W. F. F. I.	20	0	0	Two orphans of K. M. C.	10	0	0
Orphan of J. McC.	10	0	0	Orphan of H. H. S.	10	0	0
Orphan of J. O.	10	0	0	Orphan of W. G. (new case)	20	0	0
Three orphans of T. McC.	20	0	0	Three orphans of C. W. D.	10	0	0
Two orphans of R. D. O'Connor	10	0	0	Seven orphans of J. W.	30	0	0
Two orphans of F. M. O.	10	0	0				
Orphan of C. Q.	10	0	0				
Orphan of C. S.	10	0	0				
				Total	£340	0	0

ROYAL ARMY MEDICAL CORPS FUND DINNER, 1919.

THE Annual Dinner was held at the Savoy Hotel on Wednesday, June 11; Field Marshal H.R.H. The Duke of Connaught, Colonel-in-Chief, presided, supported by Lieut.-Gen. Sir John Goodwin, the present Director-General, Army Medical Service, and three past Director-Generals, Lieut.-Gens. Sir Alfred Keogh, Sir Launcelotte Gubbins, and Sir Arthur Sloggett.

Three hundred and twenty-four Officers were present, and amongst the guests were many eminent representatives of the medical profession who served in the Special Reserve, Territorial Force, or who had held Temporary Commissions in the Royal Army Medical Corps during the War. The following is a list of Regular Officers who were present:—

Lieutenant-Generals.—Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S.; Sir A. Keogh, G.C.B., G.C.V.O., C.H.; Sir W. L. Gubbins, K.C.B., M.V.O.; Sir A. T. Sloggett, Knt., K.C.B., K.C.M.G., K.C.V.O.; Sir Wm. Babbie, V.C., K.C.M.G., C.B., K.H.S.

Major-Generals.—Sir W. G. A. Bedford, K.C.M.G., C.B.; E. G. Browne, C.B., C.M.G.; Sir G. D. Bourke, K.C.M.G., C.B.; A. P. Blenkinsop, C.B., C.M.G.; Sir D. Bruce, Knt., K.C.B.; H. Carr, C.B.; J. C. Culling, C.B.; Sir Wm. Donovan, K.C.B.; Sir T. J. Gallwey, K.C.M.G., C.B.; S. Guise Moors, C.B., C.M.G.; W. W. Kenny, C.B.; Sir W. B. Leishman, K.C.M.G., C.B.; O. E. P. Lloyd, V.C., C.B.; S. Macdonald, C.B., C.M.G., K.H.P.; Sir W. G. Macpherson, K.C.M.G., C.B.; Sir W. W. Pike, K.C.M.G., D.S.O.; Sir M. W. Russell, K.C.M.G., C.B.; G. B. Stanistreet, C.B., C.M.G.; W. T. Swan, C.B.; A. A. Sutton, C.B., D.S.O.; J. Thomson, C.B.; Sir H. N. Thompson, K.C.M.G., C.B., D.S.O.; Sir H. R. Whitehead; K.C.B.; Sir M. T. Yarr, K.C.M.G., C.B.

Surgeon-General.—W. F. Burnett.

Surgeon Major-General.—Sir A. F. Bradshaw, K.C.B., K.H.P.

Colonels.—J. M. Beamish; W. G. Beyts, C.B.E.; W. W. O. Beveridge; A. W. Bewley, C.M.G.; R. J. Blackham, C.M.G., C.I.E., D.S.O.; H. J. S. Bostock; R. J. C. Cottell; D. J. Collins; S. L. Cummins, C.M.G.; A. E. J. Croly; S. F. Clark; R. H. Forman W. R. P. Goodwin, D.S.O.; W. L. Gray, C.M.G.; S. F. St. D. Green, C.B.E.; W. E. Hardy; L. W. Harrison, D.S.O., K.H.P.; J. A. Hartigan, C.M.G., D.S.O.; H. Herrick, C.M.G., D.S.O.; H. A. Hinge, C.M.G., D.S.O.; Sir W. H. Horrocks, K.C.M.G., C.B.; G. S. McLoughlin, C.M.G., D.S.O.; J. R. McMunn, C.M.G.; W. Allan May, C.B.; C. K. Morgan, C.M.G.; R. R. H. Moore; Sir J. Magill, K.C.B.; H. W. Murray; L. T. M. Nash, C.M.G.; A. Peterkin, C.B.; H. V. Prynn, D.S.O.; E. M. Pilcher, C.B., D.S.O., K.H.S.; G. T. Rawnsley, C.B., C.M.G.; O. L. Robinson, C.M.G., K.H.P.; S. C. B. Robinson, C.B.; D. D. Shanahan, C.M.G., D.S.O.; F. Smith, C.B., C.M.G., D.S.O.; R. J. S. Simpson, C.B., C.M.G.; C. H. Turner; C. R. Tyrrell, C.B.; D. Wardrop, C.B., C.V.O.; A. L. A. Webb; Sir E. S. Worthington, K.C.V.O., C.M.G.; C. A. Young, C.B., C.M.G.

Lieutenant-Colonels.—F. Ashe; J. A. Anderson; A. C. Adderley, D.S.O.; F. E. Barrow; W. Benson, D.S.O.; J. G. Bell, D.S.O.; R. P. Bond; U. J. Bourke; F. J. Brakenridge, C.M.G.; H. O. B. Browne-Mason, D.S.O.; R. T. Brown, C.M.G., D.S.O.; J. B. W. Buchanan; E. P. Connolly; F. G. Fitzgerald, D.S.O.; C. H. Furnivall, C.M.G.; J. S. Gallie, C.M.G., D.S.O.; J. A. Gormley; A. R. Greenwood; D. Harvey, C.M.G.; P. H. Henderson, D.S.O.; A. J. Hull; G. J. Houghton, D.S.O.; F. S. Irvine, C.M.G., D.S.O.; T. E. Inkson, V.C., D.S.O.; A. D. Jameson; H. E. R. James, C.B., C.M.G., O.B.E.; A. M. McLaughlin; J. F. Martin, C.M.G., C.B.E., D.S.O.; F. P. Nichols; H. L. W. Norrington, D.S.O.; W. H. Pinches; L. M. Purser, D.S.O.; N. J. C. Rutherford, D.S.O.; E. Ryan, C.M.G., D.S.O.; L. F. Smith, C.M.G.; H. G. F. Stallard; W. Turner, C.M.G.; G. E. Twiss, C.M.G.; J. W. West, C.M.G.; S. H. Withers, C.M.G.; A. L. A. Webb, C.M.G.; G. Wilson; E. M. Wilson, C.B., C.M.G., D.S.O.

Majors.—E. B. Booth, D.S.O.; G. H. J. Brown, D.S.O.; W. Byam; M. G. Dill; F. T. Dowling; N. E. Dunkerton, D.S.O.; R. F. O'T. Dickinson; Qmr. T. Exton; W. R. Galwey, O.B.E., M.C.; A. C. H. Gray; G. A. D. Harvey, C.M.G.; W. D. C. Kelly, D.S.O.; M. P. Leahy; D. B. McGrigor; J. St. A. Maughan, D.S.O.; A. T. S. McCorroy, M.C.; C. W. O'Brien; G. R. Painton; E. T. Potts, C.M.G., D.S.O.; R. C. Priest; M. B. H. Ritchie, D.S.O.; Qmr. H. Spackman; J. W. L. Scott, D.S.O.; W. C. Smales, D.S.O.; A. B. Smallman, D.S.O.; G. G. Tabuteau, D.S.O.; W. F. Tyndale, C.M.G., D.S.O.

Captains.—E. B. Allnutt, M.C.; T. C. R. Archer; J. D. Bowie, D.S.O.; E. G. H. Cowen; N. Cantlie, M.C.; E. G. S. Cane; H. S. Dickson; A. P. Draper; A. L. Foster; R. W. Galloway, D.S.O.; R. G. S. Gregg; H. P. Hart, M.C.; J. E. Hepper; M. King, M.C.; E. F. W. McKenzie, M.C.; T. E. Osmond; C. M. Rigby; H. N. Stafford, M.C.; E. A. Strachan; J. W. C. Stubbs, M.C.; A. D. Stirling, D.S.O.; E. W. Vaughan, D.S.O., M.C. A. R. Wright, D.S.O.; A. G. Wells, D.S.O.; N. T. Whitehead, M.C.

Selected musicians from the Band of the Corps were in attendance under the direction of the Bandmaster, R.A.M.C. The following programme of music was performed:—

PROGRAMME OF MUSIC.

1. Overture	"Orpheus aux Enfers"	Offenbach.
2. Dances	"Three Hungarian Dances"	Brahms.
3. Selection	"Chu-Chin-Chow"	Norton.
4. Morceaux	{ (1) "I know of two Bright Eyes"	Clutsam.
	{ (2) "Un Peu d'Amour"	Silesu.
5. Valse	"Missouri"	J. V. Eppel.
6. Selection	"Iolanthe"	Sullivan.
7. Morceaux	{ (1) "Melody in F."	Rubenstein.
	{ (2) "Humoreske"	Dvorak.
8. Suite	"A Lover in Damascus"	Amy Woodforde-Finden.
9. Dance	(3) Dances from "Nell Gwynne"	E. German.
10. Selection	"The Gondoliers"	Sullivan.
11. Valse	"The Lilac Domino"	Cuvellier.
12. Selection of Irish Melodies		

MENU.

Melon frappé au Porto.

Consommé cultivateur.

Darne de Saumon à la Royale, Pommes vapeur.

Quartier d'Agneau à la française.

Fricassée de Volaille Sultane, Cœurs de Romaine.

Asperges Vertes, Sauce divine.

Fraises Riviéra.

Canapé Diane. Café.

The guests invited included the following:—

Major-Generals.—Sir A. Bowly, Sir B. Dawson, G. la F. Foster (Canadians), Sir W. Herringham, Sir G. Makins, Sir B. Moynihan, Sir R. Jones, Sir R. H. Luce.

Colonels.—Sir R. Armstrong Jones, G. Barling, Sir H. E. Bruce-Porter, J. P. Bush, E. F. Buzzard, Sir J. Cantlie, W. Coates, H. Davy, W. L. Eames, T. R. Elliot, W. H. W. Elliott, Sir J. Fowler, G. E. Gask, A. B. Gemmel, J. Griffiths, W. E. Hume, W. Hunter, D. W. C. Jones, Sir J. Lynn-Thomas, Sir A. Mayo-Robson, Sir T. Myles, J. F. O'Carroll, T. H. Openshaw, Sir W. Osler, J. H. Parsons, W. Ranson, Sir H. M. Rigby, Sir R. Ross, J. Sherren, A. B. Soltau, Sir H. J. Stiles, J. Swain, Sir C. J. Symonds, W. Thorburn, A. H. Tubby, W. A. Turner, J. Turton, H. Wade, V. Warren Low, Sir C. G. Watson, A. E. Webb-Johnson, A. S. Woodward.

Surgeon-Colonel.—R. J. Reece.

Lieut.-Colonels.—D. J. Armour, N. Barnett, A. Balfour, J. J. G. Blandford, Sir J. Bland-Sutton, Sir N. Burnett, W. Collier, H. Collinson, M. Craig, H. C. Donald, U. M. Dawson, C. Dwyer, S. C. Elgee, E. F. Elliot, Sir T. G. English, Sir J. Fowler, H. French, S. Fleming, E. W. Goodall, F. R. Hill, H. R. Kenwood, H. A. Kidd, A. Lees, E. J. MacLean, W. R. Matthews, G. E. Miles, E. C. Montgomery-Smith, F. W. Mott, S. Mort, B. E. Myers, Sir A. Pearce-Gould, S. P. Phillips, Sir A. D. Reid, R. G. Rows, P. Sargent, T. R. St. Johnston, R. R. Sleman, J. Smart, K. Stansfield, Sir N. Tirard, P. C. E. Tribe, Vincent, F. E. A. Webb, W. I. de C. Wheeler, A. White Robertson, W. H. Willcox, A. Wilson, W. Wrangham.

Majors.—A. Abrahams, T. R. Bradshaw, F. F. Burghard, E. T. J. Cory, W. McA. Ecoles, T. W. Eden, A. C. Farquharson, C. M. Fegen, B. M. Footner, H. D. Gillies, St. G. E. Harris, E. F. W. Mackenzie, J. H. Peek, R. T. Smith, R. H. J. Swan, J. Taylor.

Captains.—H. Davies Colley, A. G. Maitland Jones, T. Sheedy, N. F. Hallows, D. A. Power. Mr. Vesey Holt, and Dr. C. Higgins.

ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND.

SUMMARY OF THE PROCEEDINGS OF THE ONE HUNDRED AND FOURTH ANNUAL GENERAL MEETING, AND OF A SPECIAL GENERAL MEETING FOLLOWING IT, WHICH WERE HELD AT THE ROYAL ARMY MEDICAL COLLEGE ON MAY 21, 1919.

Present.

Deputy Surg.-Gen. W. G. Don, Vice-President, in the Chair.

Major-Gen. W. S. M. Price, Vice-President.

Lieut.-Gen. Sir W. L. Gubbins, K.C.B., M.V.O.

Major-Gen. Sir G. D. Bourke, K.C.M.G., C.B.

Major-Gen. Sir H. R. Whitehead, K.C.B.

Major-Gen. Sir W. G. Macpherson, K.C.M.G., C.B.

Major-Gen. Sir W. B. Leishman, K.C.M.G., C.B., F.R.S., K.H.P.

Col. Sir W. H. Horrocks, K.C.M.G., C.B.

Col. S. Guise Moores, C.B., C.M.G.

Lieut.-Col. J. F. Martin, C.M.G.

Major A. H. McN. Mitchell.

Major W. C. Smales, D.S.O.

- (1) The notice in the *Times* of May 1 convening the meeting was read.
- (2) The Minutes of the previous Annual General Meeting were read and confirmed.
- (3) The Accounts and Report for the year 1918 were unanimously adopted.
- (4) Messrs. Deloitte and Co. were appointed Auditors for the current year.
- (5) A letter having been read from the Director-General, in which he said that he much appreciated the proposal that he be elected an Honorary Member of the Society and Honorary President thereof, it was proposed by Lieut.-Gen. Sir W. L. Gubbins, seconded by Sir W. B. Leishman, and carried unanimously: "that Lieut.-Gen. Sir John Goodwin, K.C.B., be elected an Honorary Member of the Society, and Honorary President thereof during his tenure of office as Director-General."
- (6) Deputy Surg.-Gen. W. G. Don was unanimously elected President of the Society.
- (7) Lieut.-Gen. Sir W. L. Gubbins and Major-Generals Sir G. D. Bourke and Sir H. R. Whitehead were unanimously elected Vice-Presidents of the Society.
- (8) Major-Gen. Sir W. B. Leishman and Col. S. Guise Moores were re-elected members of the Committee for the coming three years, as were Col. R. H. Firth, C.B., Lieut.-Cols. J. F. Martin, C.M.G., and W. R. P. Goodwin, D.S.O., and Major A. C. H. Gray.
- (9) The Committee, in accordance with Rule XXI, submitted for confirmation their re-appointment of Capt. J. T. Clapham as Secretary of the Society for a further period of five years from April 1, 1919, at a salary of £250 per annum, on account of his services to the Society during the past ten years, and having regard to the increased cost of living; with an office allowance of £60 per annum as at present.

On the proposal of the Chairman this appointment was unanimously approved and the increase in salary was confirmed.

The Meeting having dissolved was then re-constituted as a Special General Meeting, in accordance with Rule XLIX, to consider a partial amendment of the Rules which was recommended by the Committee and, on the proposal of the Chairman, the following partial amendment was carried unanimously:—

- (a) Rule V., Section (4), line 14: After the word "date" insert the following:—
"But an annual subscription of more than £10 may be paid in equal half-yearly instalments: the first instalment upon entry into the married class, and the second instalment six months after that date, and subsequent half yearly payments at intervals of six months from that date, provided always that, in the event of the death of a member before the full amount of the last annual subscription has been paid, the balance unpaid shall be deducted from the amount payable to the beneficiary at the death of the member."
- (b) Rule VI, 3rd paragraph, line 5: After the word "period" insert:—
"or by equal half-yearly instalments under the conditions laid down in Rule V."
- (c) Rule VI, 4th paragraph: After the table insert:—
"It shall be optional to a married member to pay his annual subscription according to the above table by equal half-yearly instalments under the conditions laid down in Rule V."

SUMMARY OF THE PROCEEDINGS OF THE QUARTERLY MEETING WHICH WAS HELD AT THE ROYAL ARMY MEDICAL COLLEGE ON JULY 2.

Present:

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.S., D.S.O., K.H.S., Director-General.
 Honorary President in the Chair.
 Deputy Surg.-Gen. W. G. Don, President.
 Major-Gen. Sir G. D. Bourke, K.C.M.G., C.B., Vice President.
 Major-Gen. Sir H. R. Whitehead, K.C.B., Vice President.
 Major-Gen. Sir W. B. Leishman, K.C.M.G., C.B., F.R.S., K.H.P.
 Major-Gen. S. Guise Moores, C.B., C.M.G.
 Lieut.-Col. J. F. Martin, C.M.G., C.B.E.
 Brevet Col. W. R. P. Goodwin, D.S.O.
 Major A. C. H. Gray, O.B.E.
 Letters from Major-Gen. W. S. M. Price and Col. Sir R. H. Firth, K.B.E., regretting their inability to be present were read.

Sir John Goodwin, in opening the Meeting, said that he much appreciated having been elected Honorary President of the Society in which he had always taken much interest. He added that he had joined it as an unmarried member when he first entered the Service. But in those days letters were not answered; and when, after some years, he wrote from India to ask what his subscription as a married member would be he could get no reply to repeated inquiries, and was obliged reluctantly to resign.

- (1) The Minutes of the previous Meeting were read and confirmed.
- (2) The following were admitted as members: Major G. F. Rugg, unmarried, subscription £2 from April 17; Lieut.-Col. A. J. Williamson, married, subscription £19 5s. 6d. from May 16; Col. E. L. Moss, M.C., married, subscription £16 12s. 4d. from June 27; Capt. J. W. G. H. Biddell, married, subscription £12 1s. 8d., from May 18; and the following as financial mem-

bers, their subscriptions having been received, but their papers not having yet arrived: Major J. C. L. Hingston, married, subscriptions £15 1s. 6d. from June 4; Capt. A. B. Preston, married, subscription £18 9s. 2d. from June 19.

(3) The death was reported of Helen Clarke, widow of the late Surg.-Major Andrew Moffitt, on May 9, aged 80; also of Eliza, widow of the late Brig.-Surg. James Crosse Johnston, who died April 8, aged 69.

The resignation of Deputy Surg.-Gen. C. A. Innes, a Past President of the Society was reported; and the Secretary was directed to express to him the sympathy of the meeting in his loss of sight.

(4) The Secretary reported that Sir James McGrigor and Mr. Titt advised that any surplus cash should be invested in the 4 per cent Funding Loan 1960-1990, but that they considered that the National War Bonds (£800) of the Society had better be held, in view of the 5 per cent premium payable on them in 1927 and 1928. It was resolved that £3,200 from cash surplus be invested in £4,000 of the 4 per cent Funding, subject to the approval of the Trustees, and the Secretary was empowered to take the necessary steps.

(5) The Secretary reported that the recent amendment of the Rules (as to giving subscribers of over £10 annually the option of paying by half-yearly instalments) had been registered under the Friendly Societies Act; and that notices were being printed to send to those concerned.

(6) A certificate from the Actuary was submitted that the Securities of the Society were Trustee Securities.

(7) An estimate for the reprint of the Rules was submitted and approved; and payment of printers' account was sanctioned.

(8) Payments of the Secretary's salary for the past quarter was authorized, as was that of office allowance and refund of petty cash expended by him.

3, Homefield Road,
Wimbledon, S. W.

J. T. CLAPHAM, Captain,
Secretary.

APPOINTMENT OF ASSISTANT MEDICAL OFFICER AT THE GOVERNMENT HOSPITAL, DURBAN.

WE have received the following letter which is published for general information:

32, Victoria Street,
Westminster, S. W.
July 22, 1919.

Sir,—I am directed by the High Commissioner to inform you that there is a vacancy for an Assistant Medical Officer at the Government Hospital, Durban, and to solicit the favour of your assistance in bringing this appointment to the notice of any likely candidates for the post who have been released, or are about to be released, from Military Service. Only single men under 35 years of age are eligible.

The terms of the appointment are as follows: (a) Three years' engagement from date of assuming duty at Durban, subject to extension by mutual agreement; (b) first class passage by steamer to Durban; (c) half salary payable during the voyage; (d) salary during engagement £400 per annum (War Bonus included), also (e) free quarters, rations and washing, as well as £25 per annum for extra rations; (f) if appointee resigns before expiration of Contract, he will be required to repay the proportionate amount of the cost of his outward passage, and will forfeit the right to free return passage.

The High Commissioner will be grateful for any assistance you could render him in this connexion.

I am Sir,
Your obedient servant,
(Signed) Secretary.

The Director-General,
Medical Services,
Adastral House, Strand, W.C.

ROYAL ARMY MEDICAL COLLEGE.

LIST OF BOOKS ADDED TO THE LIBRARY DURING THE MONTHS OF
APRIL, MAY AND JUNE, 1919.

Title of Work and Author	Edition	Date	How obtained
Kala-Azar : its Diagnosis and Treatment. By Ernest Muir, M.D.		1918	Library Grant.
The Whole Duty of the Regimental Medical Officer. By Capt. P. Wood, R.A.M.C.		1919	" "
Sanitation in War. By Lieut.-Col. P. S. Lilian, C.B., R.A.M.C.	3rd	1919	" "
The History of St. Bartholomew's Hospital. By Norman Moore, M.D.		1918	" "
Handbook of Photomicrography. By Hind and Randles		1918	" "
The Orthopædic Treatment of Gunshot Injuries. By Leo Mayer, A.M., M.D.		1918	" "
A Text-Book of General Bacteriology. By E. O. Jordan, Ph.D.	6th	1918	" "
A Treatise on Cystoscopy and Urethroscopy. By Dr. George Luys. Translated by A. L. Woolbarst, M.D.		1918	" "
The Doctor in War. By Woods Hutchinson, M.A., M.D.		1918	" "
Clinical Microscopy and Chemistry. By F. A. McJunkin, M.A., M.D.		1919	" "
Tropical Surgery and Diseases of the Far East. By John R. McDill, M.D.		1918	" "
Malaria and its Treatment in the Line and at the Base. By Capt. A. C. Alport, R.A.M.C. (T.).		1919	" "
Lenzmann's Manual of Emergencies. By J. Snowman, M.D.		1919	" "
Clinical Surgical Diagnosis. By F. de Quervain. Translated by J. Snowman, M.D.	2nd	1917	" "
Army Dentistry. Edited by F. A. Keyes, D.M.D.		1918	" "
United States Army X-Ray Manual		1919	" "
The Australian Army Medical Corps in Egypt. By Lieut.-Col. James W. Barrett, C.M.G., and Lieut. P. E. Deane, A.A.M.C.		1918	" "
Gunshot Fractures of the Extremities. By Lieut.-Col. Joseph A. Blake, Medical Corps, U.S.A.		1918	" "
The Soldier's Heart and the Effort Syndrome. By Thomas Lewis, M.D.		1918	" "
Aids in the Commercial Analysis of Oils, Fats, and their Commercial Products. By G. F. Pickering		1917	" "
An Index of Prognosis and End-Results of Treatment. Edited by A. Rundle Short, M.D.	2nd	1918	" "
Intravenous Injection in Wound Shock. By W. M. Bayliss, M.A., D.Sc., F.R.S.		1918	" "
Diseases of the Heart. By F. W. Price, M.D.		1918	" "
The Diagnosis and Treatment of Venereal Diseases in General Practice. By Lt.-Col. L. W. Harrison, D.S.O., R.A.M.C.	2nd	1919	" "
A Medical Field Service Handbook. By C. Max Page, D.S.O.		1919	" "
Manual of Bacteriology. By Muir and Ritchie	7th	1919	" "
Pye's Surgical Handcraft. Edited by W. H. Clayton-Green, B.A., M.D.	8th	1919	" "
The Diagnostics and Treatment of Tropical Diseases. By E. R. Stitt, M.D.	2nd	1917	" "

LIST OF BOOKS ADDED TO THE LIBRARY—Continued.

Title of Work and Author	Edition	Date	How obtained
Urinary Analysis and Diagnosis. By Louis Heitzmann, M.D.	3rd	1915	Library Grant.
Foods and their Adulteration. By Harvey W. Wiley, M.D.	3rd	1918	" "
Food Poisoning. By E. O. Jordan		1918	" "
The Chemists' Year Book, 1918-19. Edited by F. W. Attack		1919	" "
The Times History of the War. Vols. i to xii		1914-17	" "
Essentials of Medical Electricity. By E. P. Cumberbatch	4th	1919	Editor, Journal.
An Inquiry into the Principles of Treatment of Broken Limbs. By William F. Fluhner, M.D.		1916	" "
Studies in Electro-Pathology. By A. White Robertson..		1918	" "
Acute Appendicitis. By C. Hamilton Whiteford ..		1917	" "
Smoke Tactics. By Lieut.-Col. P. R. Worrall, D.S.O., M.C.		1919	" "
The Science and Art of Deep Breathing. By Shozaburo Otabe, M.D.		1919	" "
The Physiology of Industrial Organization and the Re-employment of the Disabled. By Prof. Jules Amar. Translated by Bernard Miall. Edited by Prof. A. F. Stanley Kent, M.A.		1918	" "
Electro-Diagnosis in War. By Zimmern and Perol. Edited by E. P. Cumberbatch		1918	" "
Medical Research Committee. Report of the Chemical Warfare Medical Committee :—			
No. 16.—Report on the Length of Stay in Hospital in the United Kingdom and the Disposal of Gas Casualties.		1918	Medical Research Committee.
No. 19.—The Ventilation of Dug-outs		1919	" "
Medical Research Committee. Statistical Reports. No. 4—600 Cases of Gunshot Wound of the Chest		1919	" "
National Health Insurance. Medical Research Committee. Special Report Series :—			
No. 26.—Reports of the Special Investigation Committee on Surgical Shock and Allied Conditions. Traumatic Toxæmia as a Factor in Shock.		1919	" "
No. 28.—Reports of the Air Medical Investigation Committee. The Sense of Stability and Balance in the Air.		1919	" "
No. 29.—A Contribution to the Study of Chronicity in Dysentery Carriers.		1919	" "
No. 30.—An Investigation of the Flexner-Y Group of Dysentery Bacilli.		1919	" "
Catalogue of the War Office Library. Part 3 (Subject Index)—Seventh Annual Supplement (January to December, 1918). Compiled by F. J. Hudleston		1919	War Office.
Chest Radiography at a Casualty Clearing Station. With Atlas. By R. Lindsay Ray, B.Sc., M.B.		1919	" "
Journal of the Royal Naval Medical Service, April, 1919		1919	The Editor.
The Lister Institute of Preventive Medicine. Collected Papers :—			
No. 11.—Parts 1 and 2		1914-15	Director, Lister Institute
No. 12.—Parts 1 and 2		1915-16	" "
No. 13.—Parts 1 and 2		1916-17	" "
Bulletin of the Canadian Army Medical Corps. Vol. i, No. 8. May, 1919.		1919	Director, Medical Services Canadian Contingent.
The Japan Medical World. February 23 to May 11, 1919		1919	The Editor.
The Kitasato Archives of Experimental Medicine. Vol. iii. No. 1. April, 1919.			Kitasato Institute for Infectious Diseases.

LIST OF BOOKS ADDED TO THE LIBRARY—Continued.

Title of Work and Author	Edition	Date	How obtained
<i>The Medical Officer.</i> April 5 to June 28		1919	The Editor.
<i>The Geographical Journal.</i> July, 1918, to April, 1919 ..			Presented by Col. R. J. S. Simpson, C.B., C.M.G.
Diagnosis and Treatment in Cases of Otitis Media (Mas- toid Disease). By Charles J. Heath, F.R.C.S.		1919	Presented by the Author.
Food Values : What they are and how to calculate them. By Margaret McKillop, M.A.		1916	Presented by Capt. R. H. A. Plimmer.
Papers on the Etiology of Cerebro-Spinal Meningitis. By Capt. J. Alison Glover, R.A.M.C.			Presented by the Author.
Seale Hayne Neurological Studies. Vol. i, Nos. 1 to 3. July—November, 1918.		1918	Presented by the Editor.
Medical War Manual. No. 6. Laboratory Methods of the United States Army. Medical Department, U.S.A.	2nd	1919	Presented by Col. S. J. Cummins, C.M.G., A.M.S.
Lumleian Lectures on Cerebro-Spinal Fever. By Sir H. Rolleston, K.C.B.		1919	Presented by the Author.

Royal Army Medical College,
July 1, 1919.

LIST OF BOOKS PRESENTED BY COL. R. KIRKPATRICK, C.B., C.M.G.

Author	Title of Work	Date
Ainslie, W.	<i>Materia Indica</i> ; or some Account of those Articles which are employed by the Hindoos, and other Eastern Nations, in their Medicine, Arts and Agriculture. 2 vols.	1826
Drury, Major H. ..	<i>The Useful Plants of India</i>	1858
Hirschfeld, L. ..	<i>Traité et Iconographie du Système Nerveux et des Organes des Sens de l'Homme</i> Atlas. Par J. B. Léveillé	1866
Huxley, T. H. ..	<i>A Manual of the Anatomy of the Vertebrated Animals</i> ..	1871
Lindley, John ..	<i>Flora "Medica."</i> New "Sydney" Society Works. A "Collection of the Published Writings of T. Addison. Edited by Dr. Wilks and Dr. Daldy	1877
Bernutz and Goupil	<i>Clinical Memoirs on the Diseases of Women.</i> Translated by A. Meadows, M.D. 2 vols.	1866-67
Bright, Dr.	<i>Memoirs on Diphtheria.</i> From the Writings of Bretonneau, Trousseau, &c. Selected and translated by R. H. Semple, M.D.	1859
Caspar, J. L. ..	<i>Clinical Memoirs on Abdominal Tumours.</i> Edited by G. H. Barlow, M.D.	1861
Diday, P.	<i>A Handbook of the Practice of Forensic Medicine.</i> Translated by G. W. Balfour, M.D. 4 vols.	1861-65
Donders, F. C. ..	<i>Selected Monographs.</i> By Czermak, Dusch, van der Kolk, Radicke and Esmarch	1861
Frerichs, F. T. ..	<i>A Treatise on Syphilis in New-Born Children and Infants at the Breast.</i> Translated by G. Whitley, M.D.	1851
Gooch	<i>Accommodation and Refraction of the Eye.</i> Translated by W. D. Moore, M.D.	1864
Griesinger, W. ..	<i>A Clinical Treatise on Diseases of the Liver.</i> Translated by C. Murchison, M.D. 2 vols.	1860-61
Heber, F.	<i>On some of the most Important Diseases peculiar to Women</i> ..	1859
Kramer, W.	<i>Mental Pathology and Therapeutics.</i> Translated by Robertson and Rutherford	1867
Lancereaux, E. ..	<i>Diseases of the Skin.</i> Vols. i and ii. Translated by C. H. Fagge	1866-68
	<i>The Aural Surgery of the Present Day.</i> Translated by H. Power	1863
	<i>Selected Monographs.</i> By Kussmaul and Fenner, Wagner and Graefe	1859
	<i>A Treatise on Syphilis.</i> Translated by G. Whitley, M.D. 2 vols.	1868-69

LIST OF BOOKS PRESENTED BY COL. R. KIRKPATRICK, C.B., C.M.G.—Continued.

Author	Title of Work	Date
Neubauer and Vogel	A Guide to the Qualitative and Quantitative Analysis of the Urine. Translated by W. D. Markham	1863
Niemeyer, F. von ..	Clinical Lectures on Pulmonary Consumption. Translated by C. Bammler, M.D.	1870
Stricker, S. ..	Manual of Human and Comparative Histology. Vol. i. Translated by H. Power	1870
Trousseau, A. ..	Lectures on Clinical Medicine. Translated by P. V. Bazire. 3 vols.	1868-70
Van der Kolk, S. ..	On the Spinal Cord and Medulla Oblongata, and on Epilepsy. Translated by W. D. Moore	1859
Wunderlich, C. A. ..	On the Temperature in Diseases: a Manual of Medical Thermometry. Translated by W. B. Woodman	1871

DEATHS.

MORPHEW.—At Norwich, on June 15, 1919, Beatrice Madeleine Morpew, dearly loved wife of Col. R. M. Morpew, A.M.S.

WAY.—On June 14, at Chale, Isle of Wight, Gladys Elizabeth Mary, the beloved wife of Capt. Leslie F. K. Way, D.S.O., R.A.M.C.

ELLIS.—On May 16, at Rhyllech, Pwllheli, N. Wales, suddenly, Philip Mackay Ellis, Major-General, A.M.S. (retired), O.B.E., J.P., County Director, B.R.C.S., Carnarvonshire, aged 64.

STEVEN.—On July 1, at Devonport Military Hospital (of appendicitis) Captain W. S. R. Steven, R.A.M.C., son of the late John Steven, Sligo, and the late Mrs. R. Steven, Belfast. Belfast address—Barden Towers, Strandtown.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

Lieut.-Colonel due for foreign service after the middle of August, probably India, wishes to exchange with officer lower on same roster. "Bonus" according to position on roster. Apply Lieut.-Colonel J. Hay Campbell, R.A.M.C., c/o Messrs. Holt & Co., 3, Whitehall Place, S.W. 1.

Colonel, under orders for India very shortly, requires an exchange, in order to remain at home. Apply Colonel, 52, The Common, Woolwich.

Lieut.-Colonel, due for tour in India early next season, wishes an exchange with Lieut.-Colonel low down on Home roster. Fair terms offered. Apply "F. J. B.," c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

Lieut.-Colonel R.A.M.C., regular, now in India, four years to complete foreign tour, desires exchange with regular Officer at home. Apply "B.S.W.," c/o "Journal of the R.A.M.C.," 8, Serle Street, W.C. 2.

FOR SALE.

R.A.M.C. Officer's full kit, made June, 1914, scarcely worn. Includes military frock coat, parade uniform, mess kit, helmet, &c., steel uniform and helmet cases, canvas kit bag, also mufti dress-suit, opera and silk hats. May be seen at T. W. Castle, Military Tailor, 27, Savile Row, W., who will undertake alterations.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

NUMBER OF REPRINTS	NUMBER OF PAGES	COST OF REPRINTS	COST OF EXCERPTS*	EXTRA FOR COVERS FOR REPRINTS			
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	8	0 6 0	0 2 9				
	16	0 10 6	0 5 0				
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	8	0 7 6	0 3 6				
	16	0 13 8	0 5 10				
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	8	0 10 0	0 4 10				
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The back outside cover is not available for advertisements.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 324, Adastral House, Victoria Embankment, E.C. 4.

A communication has been received from Lieutenant-Colonel K. F. Standage; Major D. E. Embleton; Captains M. E. MacGregor, J. Chalmers, R. J. S. Macdonald.

The following publications have been received:—

British: The Medical Journal of Australia, The Journal of Tropical Medicine and Hygiene, The Medical Press, Seale Hayne Neurological Studies, The Hospital, The Journal of the Royal Army Service Corps, The Practitioner, The Medical Review, The Medical Journal of South Africa, Annals of Tropical Medicine and Parasitology, The Royal Engineers' Journal, Public Health, The Journal of State Medicine, Guy's Hospital Gazette, Journal of the Royal United Service Institution, Tropical Diseases Bulletin, Proceedings of the Royal Society of Medicine, The Indian Medical Gazette, The Quarterly Journal of Medicine, Edinburgh Medical Journal.

Foreign: Surgery, Gynaecology and Obstetrics. Archives de Médecine et de Pharmacie Militaire, Office International d'Hygiène Publique, Annali di Medicina Navale e Coloniale, Bulletin de l'Institut Pasteur, Abstract of Bacteriology, Archives Médicales Belges, The Journal of Infectious Diseases, Colonies et Marine, United States Public Health Service, Military Surgeon, Giornale di Medicina Militare, L'Ospedale Maggiore, The American Journal of Syphilis, Militaerlaegen, Memorias do Instituto Oswaldo Cruz, Bulletin de la Société de Pathologie Exotique.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," 25, Adastral House, Victoria Embankment, E.C. 4, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co." and made payable to the "Hon. Manager, Journal R.A.M.C." and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,

"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"

25, ADASTRAL HOUSE, VICTORIA EMBANKMENT, E.C. 4.

Journal

of the

Royal Army Medical Corps.

Original Communications.

EAST AFRICAN RELAPSING FEVER.

BY CAPTAIN J. K. MANSON,
Royal Army Medical Corps.

AND

CAPTAIN L. H. D. THORNTON,
Royal Army Medical Corps.

THE notes and observations which form the subject of this publication were recorded during the latter end of 1917 and during 1918 up to October, and were compiled in the Carrier Depot Hospital, Dar-es-Salaam. The great majority of our cases were drawn from the area around Dar-es-Salaam under the supervision of the Medical Department of the Military Labour Corps, though a certain number under our charge came from more distant localities along with the various sick and wounded evacuated from the area of active military operations. The cases of relapsing fever upon which our observations are based were all natives, and among them were members of almost every tribe in East and West Africa. We have been in addition so fortunate as to obtain notes on a number of cases of the disease occurring in whites, and reference will be made to these as occasion demands in order that a perspective of the disease as extended as possible may be given. Before proceeding further let us state our regrets for the many shortcomings which we are well aware are presented by these notes; we would plead in extenuation that both of us have had many calls upon our time other than the study of relapsing fever, and that, owing to the almost complete inaccessibility of any literature on the subject, our observations have followed along such lines as appeared indicated to us at the time, and we have perhaps, unwittingly, left almost untouched subjects of considerable importance. Many of our results, especially as

regards treatment, are of a negative nature, but we venture to include them in detail in the hope that they may prove of assistance to other workers who have not such abundance of material upon which to pursue their investigations.

EPIDEMIOLOGY.

Incidence and Immunity.

During the periods mentioned above we have had under our care 1,500 cases of relapsing fever, all of which were microscopically diagnosed as such. This large number can, on broad lines, be divided racially into several large groups according to the manner in which they reacted to the disease.

(1) European.

(2) West African : composed chiefly of natives of the following tribes : Nigerians, Mendies, Hausas, Timinies, and natives of Sierra Leone.

(3) Central East African : comprising the great majority of native tribes of the interior of British and German East Africa, conspicuous among them being the Kavirondo, the Kikuyu and the Mnyamwezi.

(4) The Baganda.

(5) Coastal East African : comprising natives of the coastal areas from Mombasa to Lindi, inhabitants of Zanzibar, and in addition certain natives living along the main caravan routes to the interior.

We are able to record a number of general observations on the relative incidence and severity of the disease manifested by these various groups.

It would appear that Europeans when exposed to the infection very readily acquire the disease, which in their case runs a very severe and protracted course, and is very frequently followed by severe complications. True, we have met with comparatively few cases among Europeans, but this would appear to be due to the care shown by the individual to avoid risk of infection, and not to any tolerance of the disease once infection has taken place. This comparative security, in our opinion, during the present campaign, speaks highly for the general efficiency shown in the medical supervision of white units.

The next group, the West African, showed a very considerable liability to infection ; West Africans in the Dar-es-Salaam area were housed in quarters which proved to be comparatively lightly tick infested, but nevertheless a very considerable proportion of the men contracted the disease. They showed a type of the disease approximating closely in severity with the European, with the exception that severe complications were very seldom met with. Relapsing fever has been described as existing extensively over wide-spread areas of West Africa, but the readiness and severity with which these men acquire the disease in East Africa, especially by contrast with the comparative immunity of certain East African groups, shortly to be described, would appear to lend support to the possibility of

the East and West African relapsing fevers being specific diseases, and due to distinct species of spirochaetes.

Considering East African natives collectively, the disease as a whole appeared in a somewhat modified or less severe form. Group 3, the large majority of the members of which were inhabitants of areas in which the disease was little if at all met with, showed a moderately severe type of disease. On the other hand, a certain proportion even of these displayed the disease only in a very slight form; such cases may well be attributed to previous attacks of the disease, acquired during their four years peregrinations in this nomadic campaign, having given rise to a certain degree of immunity.

Cases in Group 4, inhabitants of the Uganda Protectorate, were only very rarely met with, and were not of a severe form, owing perhaps to the long standing prevalence of the disease in Uganda.

The last group, Group 5, consisting mainly of coast boys, showed a marked tolerance to the disease. Owing to the exigencies of the campaign, many thousands of these boys were living under our observation for many months in quarters heavily tick infested, yet the number of cases occurring amongst them was proportionately very small; the great majority of these boys were undoubtedly repeatedly infected during this period but showed no manifestation of the disease. Taking into consideration the fact that native houses along the coast and caravan routes have for generations been heavily infested with ticks, and the disease among the inhabitants has been extremely common and widespread, we consider we are justified in assuming that infection in early childhood is the lot of the great majority of natives in these areas. By this means it is probable that a high degree of immunity is developed by the time adult life is reached, and this, in our opinion, affords the only explanation of the fact that *over one-third of our untreated cases belonging to the coastal group showed only an initial rise of temperature, with spirilla in the blood, not followed by any subsequent relapse*. It would appear that this immunity, though always present to a considerable degree, tends to undergo fairly rapid diminution, and it is by these abortive attacks that immunity is maintained to a degree sufficient to prevent the manifestation of the more classical form of the disease.

Method of Transmission.

Investigation of the cases of relapsing fever admitted to hospital has shown clearly that the distribution of the disease coincides very closely with the distribution of *Ornithodoros moubata*. Wherever the latter occurred, cases of the disease in greater or lesser numbers were always met with. Further, an increase of the latter in one area has been noted to precede any large increase in the number of cases from that area. For example, the Invalid Camp, Carrier Depot, Dar-es-Salaam, had for many months been to all intents and purposes free from ticks, only some three or four cases of the disease having occurred there during a period of

four months. In July, 1918, a few cases occurred, and investigation of the bandas (= native hut) showed that many of them had become heavily infested with ticks; a rapid increase in the number of cases followed, some seventy-five porters acquiring the disease in six weeks out of a total of about 400 living in these quarters. Immediate steps were taken to render the men's quarters free from ticks, with the result that no further cases occurred after the incubation period had passed, during which those men infected previous to prophylactic measures developed the disease. The converse holds true; camps and areas which did not contain *O. moubata* never yielded any cases of relapsing fever, the single exception being a case of a white British rank who contracted the disease after only three weeks' residence in East Africa, all of which time he spent at a camp near the sea. Here thorough search failed to reveal ticks, and the manner of his infection must remain a mystery.

The possibility of there being carriers of the causative organism other than *O. moubata* was not lost sight of. Bed bugs, lice, fleas, and chiggers, all common inhabitants of porters' quarters, came under suspicion, but no evidence could be obtained to incriminate them; it has been noted throughout our investigations that the number of these various pests bore no relation to the incidence of relapsing fever. Further, a considerable number of fleas, lice, and bed bugs have been examined microscopically, the result being absolute failure to identify *Spirillum duttoni* in any of these. It is possible, however, that by the bite of any of these insects infection may be directly conveyed from an infected to a non-infected person; the same holds true for biting flies and mosquitoes, but there would appear to be no evidence from our observations of the organism maintaining an existence in these insects for any length of time. Hence it is our opinion that *O. moubata* was the only carrier of the infection in the Dar-es-Salaam area whereby the disease was spread.

It is not proposed to enter into a minute description of *O. moubata*. The following observations of its habits, etc., are, however, of great importance in the provision of measures necessary to control and eradicate the disease in infected camps. These ticks are extremely resistant to heat and to germicides, and appear to be able to exist for very long periods deprived of food and air. We have had some specimens without food in test tubes sealed with paraffin wax for over nine months, which are still alive, and a case has been quoted to us of ticks remaining alive in a bottle for four years without food. Their habitat is essentially the loose sand of the floors of the native houses; when the floors are beaten hard, they are usually found in the earth around the poles supporting the house, as owing to the action of the wind on these poles the earth immediately around them becomes slightly loose; we have seldom found them at a depth greater than six inches, either in the soil or around the poles. Statements to the effect that ticks were to be found in banda roofs in Dar-es-salaam proved to be without foundation as far as we could ascertain, prolonged

search of many roofs in the Military Labour Corps area produced nothing but a varied collection of fleas, lice, etc. Ticks manifest great antipathy to light, remaining in the sand throughout the day, and only appearing to feed on the inmates of the house at night; the presence of a lamp even appears to afford a considerable amount of protection.

Eggs are deposited in the sand; from observations on ticks kept in test tubes, it would appear that each tick lays some one hundred to three hundred eggs, in batches at short intervals; these eggs hatch out into ticks after an interval of about sixteen days; the nymphs are complete replicas of the full-grown insect, except that they are of a light brown colour and have relatively longer legs; they possess four pairs of legs from the moment of hatching out. As regards the ticks collected from various areas, between six and seven hundred were examined microscopically (for method see Appendix 2), and of these twenty-nine per cent were found to be infected with *S. duttoni*. Taken generally those collected from different camps all showed much the same percentage of infection, with the exception of those obtained from the West African Carrier Depot, Dar-es-Salaam, a camp which yields a particularly small number of ticks proportionate to the number of cases of tick fever occurring; these ticks were, however, very heavily infected, no less than fifty-five per cent harbouring the spirillum. It is highly probable that our estimates of the percentage of infection are considerably on the low side, as, owing to the numbers to be dealt with and the dearth of skilled assistance, only a comparatively cursory examination could be given to each slide (the Germans are reputed to have found over fifty per cent of ticks infected along the main caravan routes of German East Africa). A number of eggs were also examined microscopically for spirilla, all with negative results.

Incubation Period.

We have experienced considerable difficulty in endeavouring to determine the duration of the interval which elapses between the infection of the patient by the bite of *O. moubata* and the first attack of the disease, as indicated by rise in temperature and the presence of spirilla in the peripheral blood. Reliable histories of being bitten by ticks at any particular time are almost impossible to obtain from natives; again, the great majority of our cases have been exposed to infection so freely for prolonged periods as to render absolutely valueless any suggestion of an admitted bite being the cause of infection. We are of opinion, however, that what appears to be the generally accepted period of ten days is on many occasions very much shortened. The following are a few of the instances which lend support to this surmise: (1) A native who had been employed as a ward boy on the hospital ship "Dongola," a position in which exposure to infection would be extremely unlikely, was transferred to duty at Carrier Depot Hospital, Dar-es-Salaam, and three days after landing from the ship developed relapsing fever. (2) A native who had

been for a long time in the post-mortem room, Carrier Depot Hospital, assisted at a post-mortem on a case of very acute relapsing fever, that had died with an enormous number of spirilla in the blood; this autopsy was performed within one hour of the patient's death. After an interval of three days the post-mortem boy developed relapsing fever; he stated most emphatically that his quarters were entirely free from ticks, which proved to be the case on examination. In fact there would appear to be every

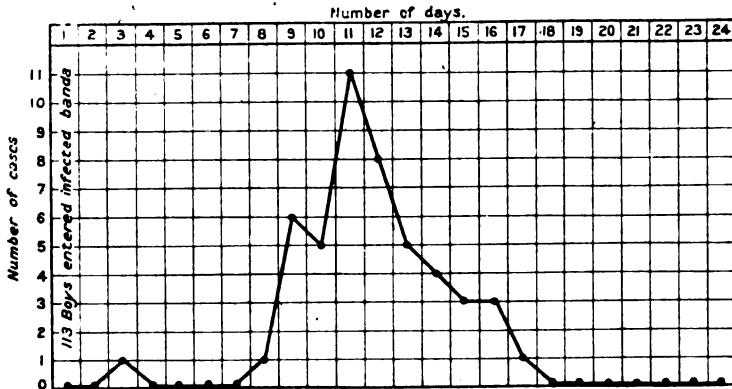


CHART I.

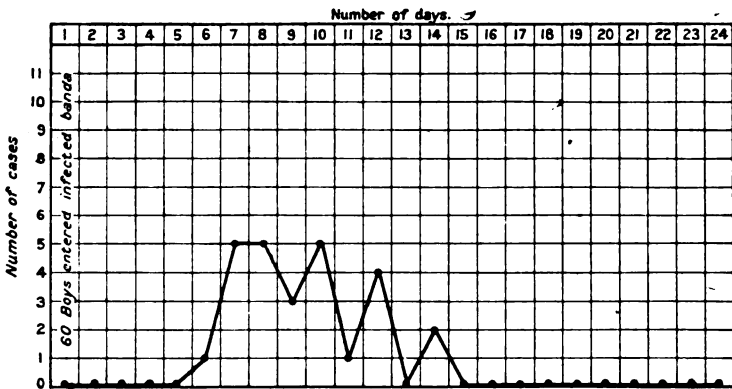


CHART II.

Two charts showing daily incidence of relapsing fever in two groups of uninfected boys placed in infected quarters.

indication that he acquired the disease at the autopsy. (3) On two occasions large drafts of boys arriving for duty from uninfected areas were placed in quarters which subsequently proved to contain large numbers of infected ticks. As soon as cases began to occur among these boys examination of their quarters led to the detection of the ticks, and the boys were at once removed to uninfected quarters; unfortunately many

boys had by this time become infected, and after varying incubation periods manifested the disease. Charts I and II show the number of cases occurring daily, plotted against the number of days elapsing between the boys entering the infected quarters and the manifestation of the disease.

From these charts it would seem that out of a total of seventy-four cases which occurred, one patient manifested the disease after three days residence in the infected quarters; that no further cases occurred until the sixth day, when one was seen; from the seventh day onwards, cases appeared with frequency on to the sixteenth day, forty-three cases, or fifty-eight per cent of the total, occurring on the ninth to the twelfth day inclusive; eighteen per cent occurred before the ninth day, and twenty-four occurred between the thirteenth day and the seventeenth, after which no cases occurred. The interpretation of these figures must remain somewhat indefinite, since there is no guarantee that all these patients acquiring the disease were infected on the first night of arrival in the infected quarters; in fact we consider this very unlikely. This fallacy would tend to reduce the above incubation period figures to even shorter periods; on the other hand, it appears to us that a very fair idea of the incubation of the disease may be obtained from a broad-minded study of these charts.

The Spirillum.

We are fully aware that many obscure problems still exist with regard to the spirillum of African relapsing fever, such as method of division, the fate and the possible pleomorphism of the organism during the apyrexial period, and its exact relationship to the spirilla of relapsing fevers of other countries, as interpreted by means of the cross-immunization experiments; such points being beyond the scope of the present paper, we will confine ourselves to such observations as appeared noteworthy to us during a routine examination conducted mainly for diagnostic purposes of a great many thousands of blood slides containing spirilla. First, we would point out that the organisms observed by us showed very great variation both in length, breadth and morphology. The majority conformed to a type 20 to 35 microns long and 0.25 to 0.35 microns in breadth, straight or slightly curved, and showing five to nine spirals; shorter forms down to 6 microns were met with commonly, while, more rarely, types reaching even to 55 microns were seen. Variation in breadth was much less common; occasionally, however, a thick type was seen very noticeably broader than the average, sometimes reaching a breadth of 0.6 microns; these forms tended as a rule to be short in length, and showed very regular and usually somewhat pronounced spirals. The difference appeared to us to be so pronounced that the occasional cases showing it were carefully observed at subsequent relapses; the resulting evidence is strongly in favour, in these cases, of the same type tending to recur in each relapse to the exclusion of the common thin type, suggesting the possibility that we were dealing with more than one specific type of organism in Dar-es-Salaam.

The greatest variations were, however, observed as regards morphology: quite often the same stained slide showed a number of different shapes, the common one being a tendency on the part of the organism to assume a circular or a looped disposition; this of course only holds in the case of dried stained specimens; it was not observed in wet specimens examined. These looped and circular forms appear, however, to be very characteristic of the African type of relapsing fever, and were met with to a greater or less degree in a large proportion of the films examined. Two other types appear to be worthy of mention, one a short medium form, in which the spiral is very close, as many as ten spirals occurring in an organism of twelve microns in length; these organisms were extremely thin and delicate, and were very rarely met with. The last type was one in which the spirilla appeared to a large extent to have lost their spirals, at any rate the latter were very slightly marked, and the organism showed more the appearance of waves than of spirals. A tendency of this latter type to dissolution was sometimes noted, especially at the termination of an attack or at a period within a few hours following a dose of salvarsan. An idea of the various types described above is best obtained from the plates appended, which was compiled from actual specimens observed under the microscope.

As regards these various types of spirilla described, we are able to put forward a few observations on their occurrence at different phases of the disease. Firstly, the organisms are in a very great majority of cases much more numerous at the first attack than at the relapses, showing a tendency to progressive diminution in numbers at each relapse, until at the last relapse very careful search is needed to detect them at all. Again, the number of spirilla is greatest during the first few hours of the rise of temperature; they may be demonstrated in the blood some hours before the temperature actually rises; show maximum numbers during the first twenty-four hours of the attack, and then gradually become fewer. We have frequently been unable to demonstrate spirilla in the blood during the twenty-four hours previous to the crisis, and when present at this time they were only seen in small numbers (*see* Chart IX). We have endeavoured to ascertain the approximate numbers of spirilla present in the peripheral blood; in the first attack the average would appear to be about 10,000 per cubic millimetre, though in many cases, even of marked clinical severity, the number of organisms was very much less, perhaps as few as 500 per cubic millimetre only being found; not infrequently, cases were met with showing a very much higher spirilla count, up to 50,000 per cubic millimetre being fairly common. Finally, a very rare class of case was met with on several occasions in which spirilla in enormous numbers were observed, in at least one case the organisms being quite as numerous as the red corpuscles; they were in these cases always of a particular type—very long, the majority being from thirty to forty microns, slightly thinner than the average organisms met with, showing

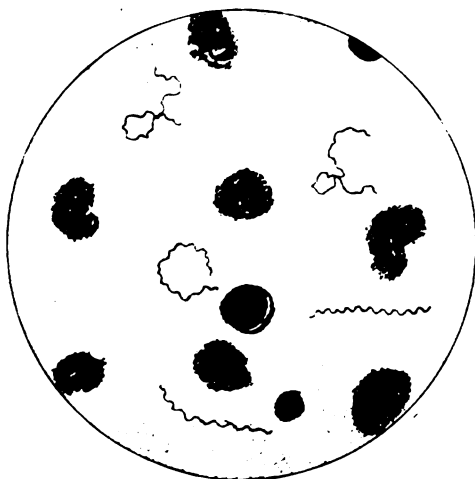


FIG. 1.

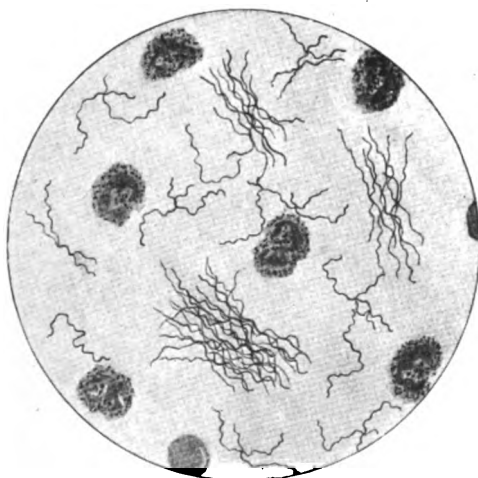


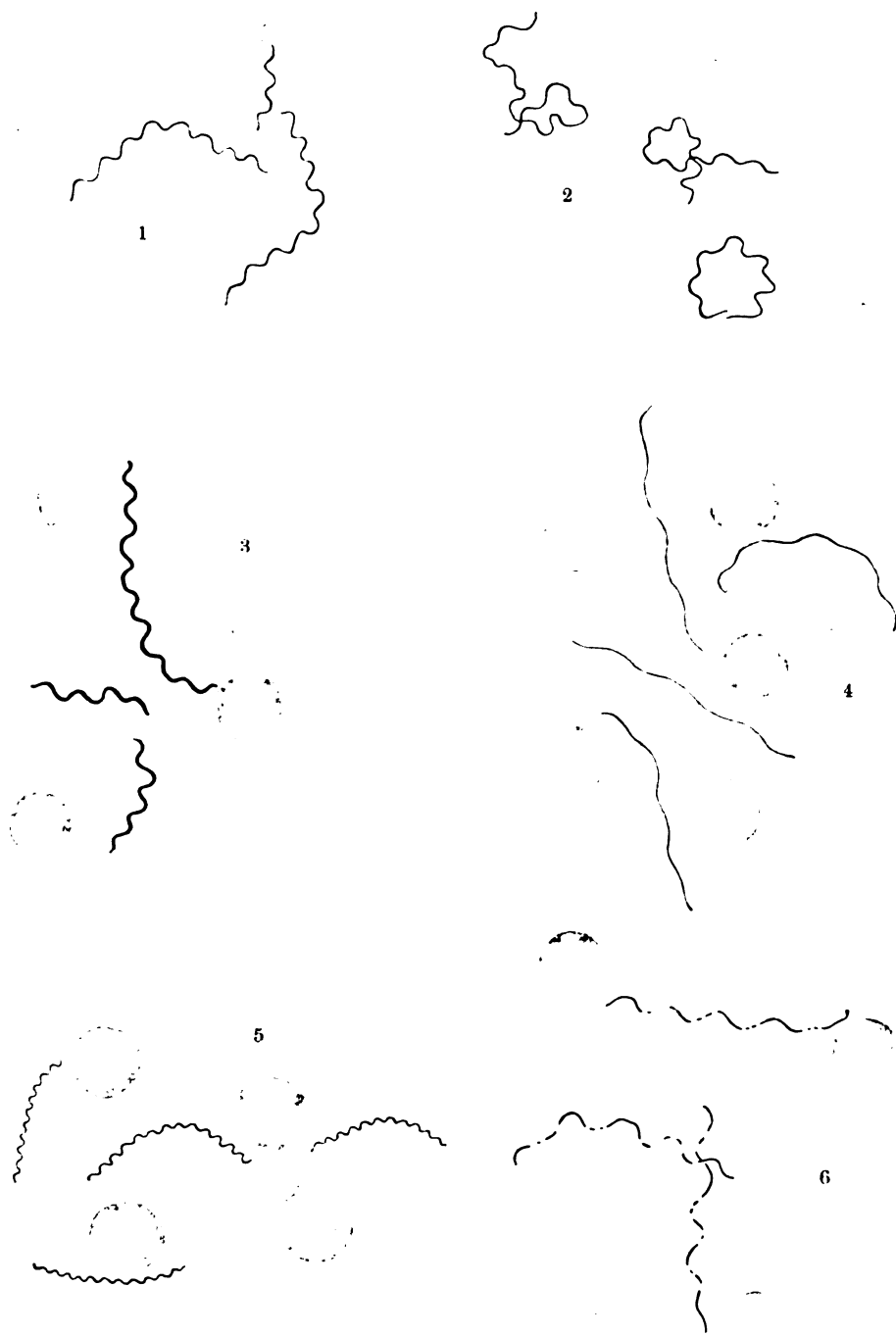
FIG. 2.

Drawings of actual Microscopic Fields, showing the appearance of the Spirilla of African Relapsing Fever in Thick Blood Films stained by Azur II-Eosin Method.

Fig. 1 shows an infection of moderate severity.

Fig. 2 shows masses of Spirilla, as met with in rare fulminating cases.

To illustrate "East African Relapsing Fever," by Captain J. K. MANSON and Captain L. H. D. THORNTON.



Drawings showing the various types of Spirilla met with in the blood in African Relapsing Fever.

Types 1 and 2 were those commonly seen.

To illustrate "East African Relapsing Fever," by Captain J. K. MANSON and
Captain L. H. D. THORNTON.

no tendency to looping, but very commonly arranged in clumps and masses ; so far as we were able to ascertain by staining methods, these long forms consisted of single individuals, there being no indication that two or more were joined together terminally ; they appear to be produced when sudden and very prolific division of the organisms takes place, and our inference is that this division is longitudinal rather than transverse. As the organisms disappear from the blood towards the end of the attack, we have often noticed a tendency for them to show signs of breaking up, as instanced by

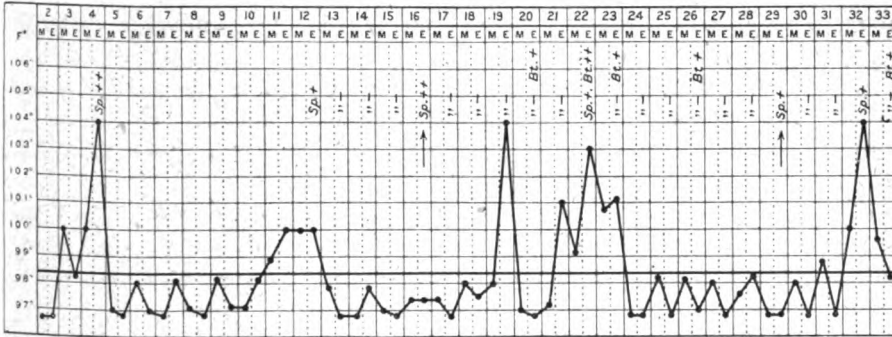


CHART III.—Untreated case complicated by benign tertian infection. Shows daily blood examination with presence of spirilla in apyrexial period on two occasions.

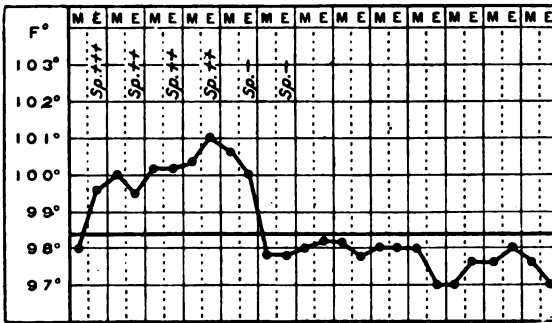


CHART IX.—Shows presence of spirilla over five days in a relapse; also tendency of the organisms to become fewer as attacks proceed.

irregularities in staining and in morphology. By the time the temperature drops to normal at the end of the attack spirilla can only rarely be found in the peripheral blood; during the apyrexial period they are not to be found until within some twelve hours of the onset of the next relapse, except on very rare occasions. As regards this latter point, daily blood examination of a number of cases throughout the whole disease has shown that very occasionally—certainly not in more than one per cent of slides examined in the apyrexial period—odd spirilla may be met with. When

present they were only found in thick blood films after prolonged search, and were always of the very short type. Chart III shows the result of the daily blood examinations in such cases. As regards the fate of the organisms during the normal apyrexial period we are without evidence upon which to base an opinion. We can only state that we have found no indication of the spirilla undergoing a granular metamorphosis, while the occasional presence of a spirillum in the apyrexial period might be held to suggest that after the destruction of the great majority at the crisis a few remaining organisms of intensified resistance betake themselves to the internal organs, where they undergo some form of cycle before taking on active multiplication previous to the next relapse. No punctures of internal organs were performed by us to verify this surmise. Examination of thin films showed no tendency of the organisms to take up a position within the red and white corpuscles; quite commonly however we observed a spirillum attached by one end to a leucocyte (almost always to a polymorph) the remainder of it lying free.

Considerable numbers of specimens from material other than blood were examined for spirilla during life; organisms were never found in the sputum, except in cases showing severe bronchial symptoms, and then only rarely; in fact we are of opinion that such spirilla found were not true inhabitants of the sputum, but had gained access to it in the blood present in the rusty sputum of such cases. The cerebrospinal fluids of some acute cases were examined, but none showed the organisms in life; one very acute case which died very early in the disease showed very considerable numbers of spirilla in the fluid taken some two hours after death at post-mortem; this was open however to the fallacy of blood contamination at autopsy, and also to that of post-mortem migration. As noted elsewhere no spirilla were found in the urines examined at various periods of the disease.

THE CLINICAL MANIFESTATIONS.

The following description of a characteristic attack of relapsing fever is drawn from our experience of some 1,500 cases occurring in natives. Many variations from this representative type occurred, some manifesting acute symptoms of the gravest severity, others merely showing a slight febrile condition indistinguishable from a mild attack of malaria, but the great majority closely followed the course about to be described. It should also be clearly understood that our description refers in the main to the period in the disease coinciding with the first rise of temperature. The symptoms observed in the relapse tend to follow along the same lines as those characteristic of the initial attack, but are, as a rule, much less severe in character; they will be dealt with in detail at a later stage.

The attack is usually preceded by a series of more or less constant prodromal symptoms. Of these the most commonly noted are:—

Lassitude : This is a well-marked and very constant symptom, and is frequently present twenty-four hours before the temperature actually rises. There is a marked inclination on the part of the patient to lie still in bed well covered with blankets, and considerable irritation is shown if there is any interference with his comfort. This feeling would appear to be very real to the patient, and even in cases where all question of malingering can be ruled out it is constantly present. *Headache* : This is of a neuralgic type and frontal situation, and is often very severe ; in a small number of cases vomiting has been observed accompanying the headache. Vertigo is also often present. The headache may be felt even though temperature is not raised, and in many cases the presence of a headache at or about the time when the rise in temperature is expected is a sure indication that an attack has begun. It persists while the temperature is rising, disappears often before the height of the fever has been reached, and is absent during the fall of the temperature as the attack passes off. *Vague pains* of a rheumatic type, easily controlled by aspirin, are very common. They are also prodromal and appear before the expected rise of temperature, persisting if untreated during the whole length of the attack, but diminishing in severity as the temperature falls again to normal. The common sites of the pain are the shins and ankles ; the back, ribs, hips and thighs are also frequently affected, while the shoulders, neck, and arms are relatively seldom involved. Less common prodromal symptoms of an attack are rigors, shivering, and a feeling of coldness in the extremities of the limbs. In our experience a rigor is very rare, and the nearest approach to it is a general feeling of coldness in the hands and feet, accompanied by goose-skin over the surface of the trunk. These prodromal symptoms of more or less severity usher in the attack and are constant in all racial types. The temperature rises suddenly, usually in the latter half of the day, and there is often a difference of several degrees between the morning and evening temperature. The height varies, but temperatures of 102° to 104° F. are common, while 106° F. has been noticed on occasions. The headache which has been persistent up to the present usually now disappears, and the patient is fairly comfortable. Delirium as a direct result of high temperature has never been noticed. The patient tends to lie in bed well covered up with blankets drawn over his head. The temperature remains up for a variable period, usually for three days, and maintains a fairly constant level, though the morning temperature may show a lowering of one or more degrees compared to the previous and subsequent morning levels. This produces a saddle-back form of chart, and its presence is almost always an indication that bronchitis, either slight or severe, is present. After remaining raised for two to four days the temperature drops, usually during the night, to subnormal ; from this point marked subnormal temperatures are very frequent. Immediately preceding crisis, some twenty-five per cent of our cases showed a slight kick of temperature which rose $\frac{1}{2}^{\circ}$ to 1° above the highest temperature

previously registered during the paroxysm; this was observed to occur only in the first attack and first relapse. During the fall of temperature profuse sweating takes place, but it is unaccompanied by the extreme collapse so frequently met with in Europeans. In our experience collapse following the crisis is extremely uncommon in natives. The crisis is always accompanied by profuse sweating and by the clearing up and disappearance of headache, if it has persisted so long, body soreness and lassitude. The patient has a good sleep and wakens with a marked sense of relief and well-being. The question of bronchial trouble during an attack of this severity will be treated in greater detail later, but it may be noted here that in all cases where a rise of temperature persists over a period of several days bronchitis of varying severity, accompanied by cough and expectoration, is a marked symptom. During the attack the urine is scanty and high coloured, as in most febrile conditions. The appetite is absent during the paroxysm, but quickly returns when the temperature falls to normal. At this time constipation is the rule, accompanied by furred tongue, bad smelling breath and foul mouth. Diarrhoea, though mentioned by some observers as a sequel to a paroxysm of fever, has not been noted amongst our cases. When present it was of independent origin and frequently due to errors of diet.

The first relapse occurs at intervals which vary from four to eighteen days, but the average duration of the interval may be taken as ten days. It is ushered in by more or less the same symptoms as the first attack, but usually these are less severe and less complained of by the patient. The rise of temperature is sudden and occurs again in the afternoon or evening. The temperature reached may exceed that observed in the first attack but its duration is relatively shorter; it seldom remains elevated more than twenty-four hours and the crisis is sudden, the temperature falling to normal or subnormal in a matter of a few hours; there is no saddle-back form of chart in a typical relapse. In this type bronchitis is not common, and cough, if present, only exists for a short time and is very slight in character. Crisis is again accompanied by sweating, and after a sleep the patient is and feels fairly well.

A second varying interval is now followed by a second relapse possessing, in most cases, all the features characterizing the first relapse, but in a minor degree. The number of relapses varies in each individual case and will be discussed in greater detail later, but it may be noted here that as relapse follows relapse there is a general tendency for each to be less severe and, finally, if left untreated, the last relapse may be only appreciated on the chart by a persistent subnormal temperature, after the ordinary apyrexial period, rising to normal and falling to its subnormal state. Such slight kicks of temperature are proved to be of spirillar origin by the demonstration of the organism in the blood at these times. Chart IV is a characteristic type of untreated African relapsing fever.

We have given above a general description of the main clinical

manifestations of a typical attack of relapsing fever; we will now state our observations on the reactions which the individual organs may show in the course of the disease.

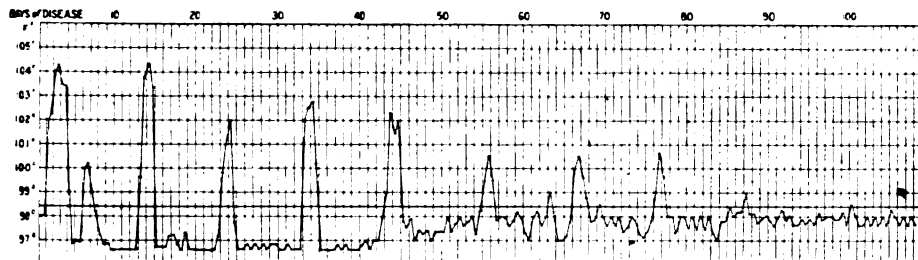


CHART IV.—Typical chart of untreated case of African relapsing fever. Note nine febrile attacks, and regular ten-day intervals.

Lungs.—Bronchitis is a well-marked symptom and often a very severe complication of tick fever. It occurs chiefly during the severer and more prolonged attacks of the disease when the temperature is raised and spirilla are present in the peripheral blood. In the vast majority of cases it is present in more or less severity in the first paroxysms of fever, and while it may occur in second or later attacks, it seems to be less pronounced as the disease tends to run its usual course, so that in the later spasms of temperature it is usually entirely absent. As was noted in the clinical description of the disease, first attacks almost invariably are accompanied by several days of temperature, the degree and height of fever being more or less evenly maintained over two or three or even four days. Such attacks show well-marked bronchial distress and are accompanied by cough and expectoration varying in degree with the amount of congestion present. The degree of bronchitis may roughly be classified into three groups: (1) *Slight bronchitis*. In this type there is a slight cough, some pain or discomfort in the chest, a slight degree of embarrassment in breathing, and if the chest is examined carefully a few rhonchi and moist râles are heard at the base of the lungs. There is no alteration in the percussion note of the chest in uncomplicated cases. This slight degree of bronchitis is most common in second or later relapses when the temperature shows a relatively sudden rise, maintaining a high level only for a few hours and falling to normal by crisis. With the fall of temperature all physical signs of bronchitis disappear, together with the cough, though expectoration occasionally persists for a day or two longer; breathing becomes normal and discomfort ceases. (2) The second type of bronchitis met with in tick fever attacks shows all the signs of *acute bronchitis*. There is a burning pain in the chest, particularly post-sternal, a sense of oppression about the chest and most distressing cough. The expectoration is at first scanty and frothy, but later becomes more mucopurulent and abundant.

The breathing is not markedly whistling or noisy in character, and physical examination shows many rhonchi and moist râles over the whole chest; the breathing is rough, and rhonchi and râles are heard during both respiratory periods. There may not be any alteration in the percussion note provided no other lung complications are present. This condition also clears up rapidly when the temperature falls, and in a matter of a few hours the patient is well and experiences no inconvenience in breathing or pain on movements of the chest walls. Chart V shows this condition.

(3) The third and least common of the three types of chest complications met with is what we have ventured to call the *pseudo-pneumonic* type. In this condition the temperature rises suddenly, remains at almost a constant level from three to four days, showing little or no evening variation, but resembling the type of temperature met with in pneumonia. It may continue for several days, when by sudden crisis the temperature falls and the attack finishes. The signs shown by the patient closely resemble those of early pneumonia. There may be slight dullness and characteristic fine crepitations, passing on to almost typical tubular breathing; the vocal resonance is increased. The patient shows many of the signs of early pneumonia: dyspnoea, pain in the chest, increased frequency of breathing and pulse-rate. Cough is persistent and annoying, and the sputum is mucopurulent, and often contains exuded blood. Restlessness and general distress are also marked. After the most careful physical examination these cases show all the signs and symptoms of early pneumonia and in our experience many of these cases have been admitted to pneumonia wards, and not until blood examination has been made has the true nature of the case been diagnosed and appropriate treatment adopted. By sudden crisis or rarely by a lysis extending over thirty-six hours, the temperature falls to normal, and the patient after a sleep awakens much improved. The sudden and complete clearing up of the physical signs in a patient apparently about to enter upon the consolidation stage of a pneumonia is a most startling and dramatic event; in no case under our care did an actual pneumonia with consolidation occur, although such appeared to be inevitable on many occasions. As regards the pathology of this condition, it would appear that the lung goes through just such early changes as are seen in ordinary lobar pneumonia. Several cases that have come to the post-mortem table have shown a condition of the most intense congestion involving the whole of both lungs, but most marked at the bases, while it has several times been a question as to whether actual consolidation had occurred or not, but we have always been able to answer this in the negative. Cases have come to post-mortem in which the fall in temperature, with consequent almost entire alleviation of bronchial symptoms, has preceded death by thirty-six hours; in these the upper lobes appeared quite clear, but a considerable degree of congestion was still seen at the bases, despite absence of symptoms. Repeated examinations of the sputum of such cases during life demonstrate the presence of spirilla in

a few cases; speaking generally, however, the latter appeared to be present rarely, and only in small numbers. A notable increase in mixed pyogenic cocci (staphylococci, streptococci, and pneumococci) was always present, and leucocyte counts of cases with severe bronchial symptoms nearly always showed a leucocytosis of 12,000 to 15,000 white cells per cubic millimetre, of which 75 per cent. to 90 per cent. were polymorphonuclears. Charts V and VI illustrate the acute bronchial condition.

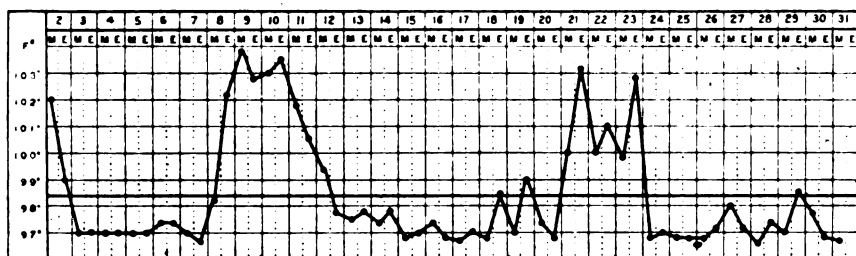


CHART V.—Second and third relapses showing prolongation due to bronchial condition. Note saddle-back type of temperature indicative of bronchial conditions in relapsing fever.

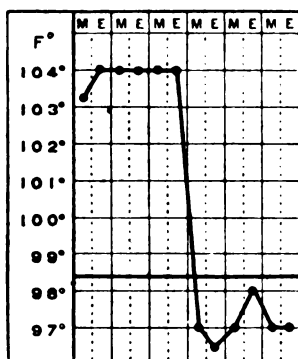


CHART VI.—First attack, showing pseudo-pneumonic type of temperature.

The Heart.—Observations made on the heart and its action during an attack of tick fever were all largely negative. There appeared to be no definite and constant symptom present which would be of any diagnostic value. During an attack of fever the heart presented only those signs commonly met with in high temperatures, and these in very minor degree. The pulse was quickened and full, but such slight changes were of a very transient nature and passed off quickly whenever the temperature returned to normal. Certain of our cases died in the first attacks with a very high temperature; the temperature mounted higher and higher and death supervened very rapidly with the temperature still rising. These attacks were of the acutest nature and presented the signs of an acute toxæmia; death appeared to result from heart failure. Post mortem, the heart

in such cases revealed an organ very relaxed and flabby, slightly dilated, and the muscle on section showed a surface pale, and very soft. The substance was easily torn, and cloudy swelling markedly present. We would mention here that our conclusions on the pathological morbid appearances of the various organs were based only on naked eye observations, as sections were not available owing to the lack of a microtome. In a second type of fatal case death ensued suddenly within the twenty-four hours following an attack. The temperature had fallen to normal and there was no indication that a fatal result would ensue beyond a slight degree of cardiac weakness in no way more severe than that to be expected in cases where the sudden crisis occurs with consequent rapid fall of temperature. Death took place in these cases usually after the second or third attack of fever. Post mortem, the heart was relaxed and flabby, dilated, with a slightly increased fatty deposit on the surface. On section the cut surface was of a pale yellowish tint, soft, friable, and with a degree of apparent fatty infiltration in the muscle. This again is a condition not incompatible with a toxæmia resulting in heart failure. In cases where the disease was more or less resistant to treatment, and relapses had been present over a long period, evidence of heart changes were present. These appeared to be more or less directly the outcome of myocardial changes, and the symptoms produced closely resembled those of dilatation, though in a minor degree. At no time did any of our cases manifest marked cardiac distress requiring urgent treatment and it was only when a systematic examination of the circulatory system was made that these signs and symptoms were elicited. The action of the heart in these cases was feeble, and the pulse soft and rapid, and in one or two cases only was irregularity noticed. Most of the cases showing these signs were fatal and one would hold out a bad prognosis in cases where signs of cardiac dilatation were detected.

The Liver.—It has been our experience that the liver during an attack of relapsing fever does undergo in practically all cases some form of change. This may be so slight that no signs of any variation from the normal may be observed by the patient, and it is only noticed when careful investigation of the organ by the physician is made. On the other hand, cases have come under our notice in which there is a very marked degree of discomfort over the hepatic region and considerable pain and tenderness are experienced. All these changes, whether slight or severe, coincide with the rise of temperature during an attack or a relapse, and take the form of enlargements of the organ. In slight cases careful percussion of the liver is necessary to demonstrate enlargement and very deep palpation is required to elicit pain or tenderness. In severe cases enlargement is easily elicited and may even be visible to the eye, while pain occurs over the hepatic area with every respiratory movement. The condition presents in such cases all the signs and symptoms of acute hepatitis; the possibility of amœbic infection was

excluded. Accompanying this condition jaundice in varying degree is often present; in slight cases it also requires to be carefully looked for before it is recognized; while in severer cases a very deep jaundice is the rule. In all our fatal cases where death could be proved primarily to be due to tick fever, jaundice was a pronounced feature of the condition, and at autopsy on all such cases deep bile staining of the tissues and other evidence of acute jaundice was found. It must be born in mind, however, that jaundice is not necessarily a feature of an attack or relapse, and that while it does very frequently occur yet it is not such a constant symptom as pain and swelling of the liver. A certain percentage of severe attacks were unaccompanied by jaundice, but in these enlargement of the liver and tenderness of that organ were present. It would appear that in fully sixty per cent of our cases enlargement of the liver accompanied by pain and tenderness was present during the attack or relapse. There would appear to be little or no change of a permanent character in the organ as a result of the attacks, except in very prolonged and severe cases where the liver was definitely enlarged and pale, but distinctly firm in consistency. The enlargement and pain quickly disappears after the attack has passed off and during the apyrexial period a normal condition of the organ is usually found. *Epistaxis* has been noted in four cases, and in none of these cases did it bear any relation to the temperature. In one it occurred during a spasm, in the others during an apyrexial period; it was severe in three cases, slight in one, but in all cases was easily controlled by plugging the anterior nares.

The Spleen.—The spleen in cases uncomplicated by malaria did not in the vast majority of instances present any striking feature. In a certain number of these cases slight tenderness and fullness over the splenic area was complained of when the temperature was high, and an attack of spirillum fever was present. At such times percussion and deep palpation showed a distinctly tender and slightly enlarged spleen. This quickly disappeared as the temperature fell to normal, and during the apyrexial period a normal condition of the organ was present. On the other hand, in cases where malaria was in evidence, involvement of the spleen, at times when spirilla rises occurred, was a well-marked feature. The presence of malarial organisms in the blood of a patient suffering from relapsing fever seems to exaggerate any tenderness of the spleen, and in such cases where the presence of malarial parasites could be demonstrated in the blood in conjunction with those of spirillum fever the tenderness and fullness over the splenic area was often a source of much discomfort to the patient. In one case extreme pain and tenderness were complained of during a spirillum rise, and in this case malarial parasites were demonstrated abundantly present in the blood. It would appear from our observations, which would seem to differ on this point from those recorded by other observers, that in the general run of cases of tick fever the spleen is not influenced to any great extent, but that, on the other hand, when the two diseases occur at

the same time the spleen may show quite marked tenderness and enlargement, requiring treatment. Post mortem the organ does not show any striking naked eye appearances except in cases where well-marked malaria is also present, and in such the spleen simply shows changes due to malarial invasion, and examination of stained films from this organ immediately after death does not indicate it as an all-important reservoir for spirilla. The characters of the spleen in the few fulminating cases mentioned previously are noted elsewhere.

The Blood.—A large number of total leucocyte and differential leucocyte counts were made with a view to determining what blood changes, if any, occurred during the disease. As a preliminary, examination was made of fifty natives uninfected with relapsing fever but in other respects similar—i.e., both classes had been equally exposed to malaria, worm infection, etc., conditions which might tend to bring about variations in the blood picture. The averages are seen in the table appended:—

	Total Leucocytes	Polymorpha	Lympho- cytes	Hyaline and Transitional	Eosino- phil	Mast cells
Normal natives	5,500	52.0	19.6	21.5	6.5	0.4
Relapsing fever, tempera- ture high, no bronchial symptoms	5,600	57.6	16.0	21.0	5.0	0.4
Relapsing fever, apyrexial period	5,500	51.5	16.4	27.0	5.0	0.1
Relapsing fever, high tem- perature, with marked bronchial symptoms ...	15,000	81.0	8.0	9.0	1.5	0.5

It will be seen that the average number of leucocytes in normal natives is low, about 5,500 per cubic millimetre; this total was not raised appreciably in patients suffering from relapsing fever either during the period of high temperature or during the apyrexial period. The very slight increase in the polymorph count (52 per cent normal to 57.6 per cent) seen in cases of high temperature does not appear to us to possess more than accidental significance, the same applying to the slight increase of hyalines (21.5 per cent normal to 27 per cent) in the apyrexial period. It appears, in fact, that the only blood change to be noted occurs in cases with high temperatures which show marked bronchial symptoms, and in these there is a definite leucocytosis of from 10,000 to 15,000 per cubic millimetre, of which some seventy-five per cent to eighty per cent are polymorphonuclears. *The Wassermann reaction* was performed on the blood in a series of cases, one set of them in the acute attack, one set in the apyrexial period, and one set in convalescence. The reaction in all these cases proved to be negative.

The Urine.—A number of urines were examined at various periods in the disease; at the paroxysm, during the apyrexial period, and during convalescence; none showed any abnormal characteristics beyond the presence of a trace of albumin in a certain number at the time of high

temperature; centrifuged specimens stained by various methods showed no evidence of spirilla. The characteristic urines containing abundant albumin, red blood corpuscles, casts and spirilla, described by Dudgeon as occurring in his Macedonian series, were never met with by us in the African type, and examination of the kidney post mortem in fatal cases showed remarkably little change in this organ.

Fulminating Cases.

There is a very rare type of fulminating case which merits careful consideration. We are able to record nine cases belonging to this group, all of which were fatal, their history being one of very acute onset, followed by coma and death within twenty-four hours of the manifestations of illness. Clinical details of these cases have been very difficult to obtain as by the time the patients arrived under our care coma had supervened and death followed very shortly. We have seen three such cases ourselves and to Captain J. W. A. Wilson, R.A.M.C., we are indebted for details of six more which occurred at Carrier Depot Hospital, Morogoro. The details of one of our cases are as follows:—

The patient was admitted to hospital during the morning with a temperature of 100° F.; he complained of no particular symptoms beyond headache, and was provisionally placed in a malaria ward. During the day a routine blood examination was made, and the patient's blood was found to be teeming with spirilla—at least five million organisms to the cubic millimetre being present; many of these organisms were massed together in clumps of several hundreds. During the evening he became comatose, his temperature rose to 102° F. and he developed a very intense degree of jaundice; death ensued at 10 p.m. the same night.

Captain Wilson's cases were so startling that, as a routine, blood films were prepared in the admission room from all cases showing temperature, as it was found that several patients died before ordinary routine blood examination could be made. He informs us that every case of this kind showed enormous numbers of spirilla in the blood, as was observed by us, and further states that the clinical similarity of these cases with cerebral malaria was almost exact, except that intense jaundice was seen in the spirilla cases. Post-mortem examination showed the tissues deeply bile stained, the gall-bladder and its ducts being apparently normal; the liver was considerably enlarged, soft, and showed a marked degree of early toxic change; the spleen showed very characteristic change, being somewhat enlarged, and so extremely soft and pulpy that before being opened with a knife it resembled nothing so much as a bag of water; smears made from the pulpy contents showed large numbers of spirilla when the examination was made shortly after death, but in cases which were not examined until an interval of several hours had elapsed, the spirilla had all disappeared; this rapid post-mortem disappearance of the organisms was similarly noted

in the other organs and in the blood, The lungs invariably showed throughout a condition of very acute congestion bordering on pneumonia, most intense at the bases ; the heart muscle was pale, but the degeneration noted in cases of longer standing did not appear to be marked ; the kidneys similarly were extremely pale and bile stained. The brain and cord showed a very intense congestion ; section of the brain showed the minute intracerebral vessels, presenting the appearance of innumerable small punctate hæmorrhages. We consider that these data, both clinical and pathological, showed a very close association with the findings observed in cerebral malaria : at any rate, we have little doubt that the masses of organisms present in the blood before death was sufficient to cause mechanical obstruction of the smaller cerebral vessels, and *the condition of coma supervening before death lent support to this assumption.* We are led to the conclusion that the toxins present in the blood of such very acute cases are not the only factors concerned in bringing about death.

(To be continued.)

THE CORRELATION OF THE PATHOLOGY AND BACTERIOLOGY OF BACILLARY DYSENTERY.

A DISSERTATION ON SOME OF THE LABORATORY PROBLEMS ARISING IN
CONNEXION WITH THIS DISEASE IN THE EASTERN THEATRES OF WAR.

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INTRODUCTORY.

THE importance from a military standpoint of bacillary dysentery, as a cause of invaliding and death, has been obvious to every medical officer on service in all the Eastern theatres of war.

At first a considerable amount of doubt existed as to which of the main forms of dysentery was the predominating one, and a great many papers appeared in print by pathologists who have had an exceptional, though perhaps somewhat brief, experience of the two forms of the disease.

During the first two years of war these papers for the most part dealt with the amoebic type, while lately they have been concerned more especially with the bacillary, since the latter, the more acute disease, has come to be recognized from a military point of view as much the more important of the two.

During the Egyptian and Palestine campaigns of the last three years I have enjoyed exceptional opportunities of reinforcing my pre-war experience of dysentery by constant daily contact with its bacteriological, pathological and clinical aspects, both at the base hospitals, on the lines of communication, as well as in the field. I have also been able through the kindness of Dr. A. G. Bagshawe, of the Tropical Diseases Bureau, to keep myself *au courant* with the literature of the subject.

PUBLISHED LABORATORY STATISTICS ON STOOL EXAMINATIONS AND THEIR IMPORT.

Many tables of statistics of stool examinations have been published from laboratories in Eastern war zones in reference to the relative prevalence of the two main forms of dysentery. Though of interest as recording the percentages of intestinal protozoa found in the fæces they do not, unless intelligently interpreted, and interpreted in connexion with the clinical data, convey a true impression as to the relative prevalence of any particular form of the disease.

On the whole the tendency has been to greatly inflate the number of cases in which *Entamæba histolytica* and conversely minimize those in which *Bacillus dysenteriae* is the causative germ [Ref. 1, 2, 3].

For reasons which appear to be more generally understood now and

which will be detailed later, the isolation and recognition of the specific bacillus from the dejecta, dependent, as it is, on so many circumstances, is by no means such an easy matter as is the detection and recognition of the *E. histolytica*. Detection of *B. dysenteriae*, even in the most favourable conditions, is a prolonged and tedious process; whilst the detection of the amoeba is to the initiated a simple matter requiring a few minutes only.

Hence the importance of the fact that for rapid urgent work—which under the circumstances of active service is what the clinician has to expect—a diagnosis of bacillary dysentery can be made by recognition of the characteristic cellular exudate (as I originally described in [4] 1910, and which has been elaborated recently by Willmore and Shearman [5]), and by exclusion of the *E. histolytica*.

The difficulties of bacteriological, as well as clinical diagnosis, are often very great. Many cases with fluid faeculent stools are originally bacillary in origin and a large proportion of cases are clinically very mild, with but a brief passage of typical dysenteric stools. Added to this, even under the most favourable circumstances, and even in practised hands, owing to extraneous contamination, to decomposition, or to some other cause, it may not be possible at a first attempt to isolate the specific bacillus from a blood and mucus stool.

I conclude that statistics based upon the number of cases of bacillary dysentery, proved bacillary by actual isolation of the specific bacillus, and any statement based on those statistics and inferences drawn as to the relative frequency of the two forms of dysentery, will be fallacious by fifty per cent.

Much depends also upon the training and experience of the observer, i.e., the personal factor.

One can imagine what statistics one would obtain from a consideration of cases clinically enteric under war conditions, even in the favourable surroundings of a base hospital. To obtain the specific enteric organism from the blood, urine and excreta in sixty per cent of all such patients, was considered to be a high proportion in the early part of 1916; for the diagnosis of the remaining forty per cent one had to rely upon evidence obtained from clinical data and from repeated Widal tests. The same considerations apply to the diagnosis of bacillary dysentery. Moreover, the habitat of this bacillus in the human body is limited to the intestinal canal, and the serological tests are by no means as satisfactory as they are in enteric. Unless all these factors are fully understood one cannot arrive at the full benefit the comparison of the published results of various laboratories should afford.

The diagnosable proportion between the two forms of dysentery will vary in different races and in different parts of the war zone. The number of bacillary cases recorded will necessarily be higher the nearer the source of infection—i.e., nearer the front line—the bacteriological examinations are made. Owing to the greater chronicity of a protozoal

infection, the same rule does not hold good for the amoebic, it follows that the proportion of entamoebæ to the number of diagnosed bacillary cases recorded during the routine examination of the fæces will be invariably higher in the base laboratories than in those nearer the front line.

STATISTICS OBTAINED ON THE PALESTINE FRONT IN THE AUTUMN
OF 1917.

The statistics accompanying this paper were made in a laboratory attached to a casualty clearing station close to the front line at a period when dysentery was most prevalent, that is from August to December, 1917.

Method of Procedure.

In order to ensure a speedy diagnosis, a system was established between the laboratory and the dysentery wards whereby the dysentery stools were brought by orderlies in bedpans as soon as passed.

Special precautions were taken, wherever possible, to prevent any urinary contamination. By this method nothing was left to chance; as it so often happens, should the selection of the specimen be left to an orderly to be taken by him to the laboratory in a specimen tube, either an unsuitable portion of the specimen is selected, or the mucus becomes grossly contaminated with fæces. The following steps were taken *seriatim* to establish a satisfactory diagnosis in as short a time as possible.

(1) Selection of a portion of gelatinous viscid blood and mucus; particles containing bright red blood were considered the most suitable; if soiled in any way with fæcal matter, a small amount was removed in a platinum loop and washed well in sterile water. Naturally at the same time a microscopic examination was made for recognition of cellular contents and absence of amoebæ. On these findings a provisional diagnosis can be given to the clinician as follows: "Cellular exudate suggests bacillary dysentery, confirmation will follow in twenty-four hours." The clinician can then act on the information and treat the case as one of bacillary dysentery in the *early stages of the disease*, a very important matter.

(2) A loopful of blood and mucus is taken and spread upon a six-inch MacConkey plate (the medium should be *carefully* neutralized—it has been used by preference throughout) and spread in a spiral manner by means of a platinum loop as advised by Whitehead and Kirkpatrick in a recent paper.

(3) The plate is incubated for eighteen hours at 37° C. The recognition¹ macroscopically of the typical colonies presents no great difficulty. There

¹ Note: It will be noted that in this respect I do not agree with Whitehead and Kirkpatrick, who aver that it is impossible to distinguish colonies of *B. dysenteriæ* from *B. fæcalis alkaligenes*, Morgan No. 1 or paracolon bacillus.

is a glassy clear-cut look about them which, after some experience, renders identification easy. They are generally the smallest colonies present on the plate and, as has been noted by the authors mentioned, they tend to increase considerably in size and become much more prominent if, after preliminary incubation, they are kept for twelve hours at a lower temperature. For this purpose I have been in the habit of placing doubtful plates in the ice-chest. From a suitable specimen, *passed early in the course of the disease*, I have had no special difficulty in recognizing the organisms, as they may occasionally constitute quite 50 per cent of the colonies on the plate.

(4) *Preliminary Agglutination.* Twenty or more typical colonies are picked off by means of a platinum spud and emulsified in 0.25 c.c. saline in an agglutination tube and identified on *Garrow's agglutinometer* (*Lancet*, February 21, 1917).

The essential part of this instrument is a glass slab divided off into thirty partitions. With a special pipette a drop of the specific serum, suitably diluted, is placed on special compartments of the slab in the following order:—

(a) Drop of Shiga serum diluted 1 in 50; (b) a drop of Flexner-Y serum diluted 1 in 50, and (c) a drop of normal saline to act as a control.

By this method as many as ten plates can be investigated at the same time.

To each drop an equal quantity of the bacillary emulsion is added, thus making the final dilution of the serum 1 in 100. The slab is then rotated in a damp chamber and after three minutes the result is read against a dark background. Coarse snowflake agglutination, quite obvious to the naked eye, takes place in one or other of the partitions. The remainder of the emulsion is then tested against the specific serum in still higher dilutions in a titre of 1 in 200—1 in 1,600, and the *end point* of agglutination determined. As a matter of actual experience I have found that the sera supplied by the Lister Institute are so specific that, when other limits of agglutination are determined in this way, a dilution of 1 in 10 of Shiga serum produces no agglutination of the Flexner-Y bacillus, and vice versa. Great care must be taken to cleanse the glass slab thoroughly with alcohol and ether and a clean piece of gauze before usage, otherwise the emulsion and serum will not properly intermingle. The end point of agglutination, as recorded upon the phials, is 1 in 1,600 for Shiga and 1 in 800 for the Flexner-Y bacillus; as a matter of fact it is my experience, *by the method described*, above 1 in 1,200 is the highest point I have been able to record for Shiga, and 1 in 600 for the Flexner-Y bacillus.

As a result of this preliminary investigation, the provisional diagnosis of bacillary dysentery can then be confirmed to the clinician after eighteen hours as follows:—

"Bacillary Dysentery—Flexner-Y or Shiga's bacillus isolated."

(5) Two typical colonies from the original plate are then subcultured on to agar and on the following morning inoculated on to the sugars to obtain the typical reactions. The point of this is that *should typical agglutinations have been obtained the biochemical reactions are always true to type.*

This method never lets one down.

THE STATISTICS UPON WHICH THIS AND OTHER STATEMENTS MENTIONED
ABOVE ARE BASED.

During the month of September, 1917, selected colonies from sixty plates were tested thoroughly (i.e., agglutination, morphological and cultural characteristics, typical sugar reactions — glucose, lactose, saccharose, mannite, dulcite; production or otherwise of indol).

(a) Of these, forty gave a preliminary coarse agglutination 1 in 100 to Shiga serum:—

In every case the sugar reactions were typical of Shiga's bacillus, no indol was produced in peptone water after forty-eight hours' incubation. The end point of agglutination on Garrow's agglutinator averaged 1 in 800, in one case as high as 1 in 1,200.

(b) Of these, twenty gave a preliminary coarse agglutination 1 in 100 to Flexner-Y serum.

All cultures gave the typical sugar reactions with the production of acid in glucose and mannite and with a variable indol reaction—ten cultures, or fifty per cent, produced no indol.

In contrast to Shiga's bacillus there was a considerable range in the titre of agglutination to the specific serum. The minimal end-point was 1 in 200; the maximal 1 in 600, average 1 in 400. This would certainly suggest the idea that there is a considerable variation in the organisms of the Flexner group (see also Martin and Williams). The reactions with maltose, this sugar being unobtainable, are not recorded. I was therefore unable to determine which gave the classical reactions of Flexner and which those of Hiss and Russell's Y bacillus¹.

For reasons to be hereafter stated, I very much doubt whether the mannite-fermenting group is such an extensive one as some investigators would have us believe. From one Egyptian stool I once isolated both the Shiga and the Y bacillus.

Here again I entirely agree with Whitehead and Kirkpatrick, who assert that "from the results obtained we are bound to conclude that the classical

¹ Fletcher, using a method of preliminary macroscopic agglutination, and Martin and Williams, using macroscopic mass agglutination in tubes, think that on this account the practice is dangerous; whilst Smartt, by using a microscopic preliminary agglutination in wetted slides, seems to have reported many obvious *B. coli* organisms as belonging to the dysentery group.

types of *B. dysenteriae* Shiga and Flexner-Y are the true causes of bacillary dysentery."

What are the special advantages of Garrow's method? These are obvious to any pathologist who has used this machine as a routine measure. They are:—

- (1) Rapidity, ease and accuracy with which results can be obtained.
- (2) The ease with which the results can be read and the end point determined. The reaction is so obvious as to eliminate the *personal factor*.
- (3) The small amount of bacillary emulsion which enables one to give an opinion on a few colonies and economy in the amount of specific sera used.

THE PARAGGLUTINATION PHENOMENON OF OTHER MEMBERS OF THE COLI GROUP.

Organisms which differ widely in their biochemical reactions from *B. dysenteriae*.

I can see no serious objection on account of this phenomenon to the procedure I have just described. In one instance only, a fine agglutination was observed in 1 in 100 Flexner-Y serum dilution of an organism which on subsequent culture produced acid and gas in the sugars. This reaction was so fine and of such low titre that it could easily be distinguished by the naked eye from the true specific coarse, snowflake agglutination; besides, the subsequent growth on agar was far too dense for that of either of the dysentery bacilli.

PROPORTION OF AMOEBIC TO BACILLARY DYSENTERY IN THIS EPIDEMIC AMONGST BRITISH TROOPS.

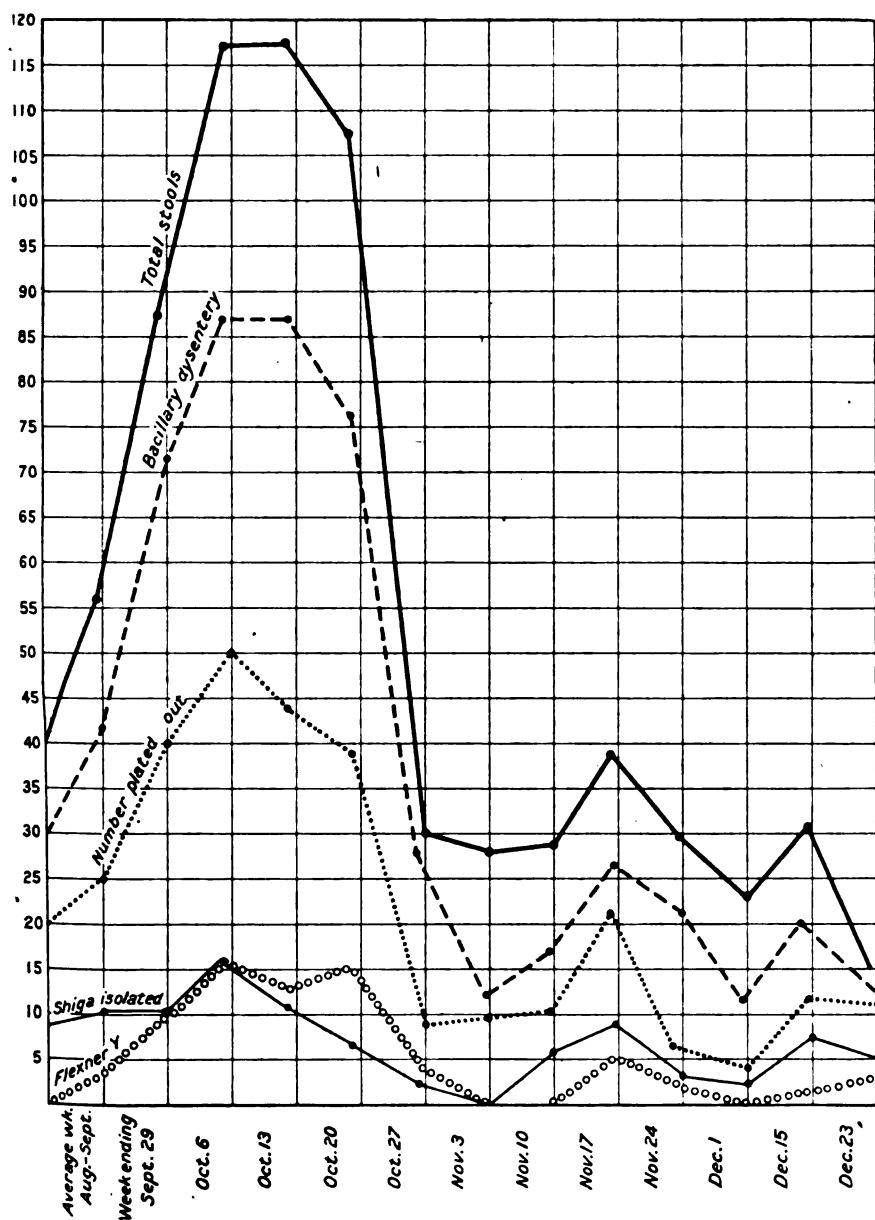
Total number of stools examined 837.

Of these the specific cause could be ascertained in 664 (the 173 cases remaining were either normal motions or cases of mild diarrhoea).

Of these 664 specimens:—

- (1) 6, or 0.9 per cent, were associated with *Lamblia intestinalis*.
- (2) 11, or 1.6 per cent, were associated with flagellates—*Tetramitus* and *Trichomonas*.
- (3) 7, or 1.05 per cent, were associated with *E. histolytica*.
- (4) 633, or 95.3 per cent, were diagnosed on characteristic exudate as *Acute Bacillary Dysentery*.
- (5) 342, or fifty-one per cent, were plated.
- (6) In 201, or 51.7 per cent of the 342 specific bacilli were isolated.
- (7) 114, or 33.5 per cent, it was the Shiga bacillus (see graph).
- (8) 87, or 25.4 per cent, it was the Flexner-Y bacillus.

The proportion of amoebic to bacillary dysentery in the series was as one to ninety-five, and, if we take into consideration that the diarrhoeas associated with flagellates under heading 2 were also probably bacillary in origin the proportion becomes even less.



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WHAT WAS THE PROPORTION OF AMŒBIC TO BACILLARY DYSENTERY AMONGST THE NATIVE EGYPTIANS AT THE SAME PERIOD?

Examination of 200 Egyptians' dysentery stools (that is from Egyptian Labour Corps hospitals) on the same lines gave the following results:—

Amœbic dysentery 14 per cent.

Bacillary dysentery 80·8 per cent.

Bilharzial dysentery 5·2 per cent.

A somewhat similar proportion was recorded for Indian troops by Woodcock in 1916.

The proportion of amœbic to bacillary dysentery is necessarily higher in native than in European troops. The prevalence of amœbic dysentery amongst native troops in the field is not to be regarded in the light of a locally acquired infection. The incubation period of the bacillary disease is a short one, while that of the amœbic, as we know from the work of Walker and Sellards [11], is a long one (forty days or more); added to this is the well-known relapsing nature of a protozoal infection. Therefore the fact that an Egyptian labourer develops an attack of amœbic dysentery in the field does not necessarily indicate that the infection has been acquired locally.

The inference to be drawn from my statistics, then, is that at the end of 1917 the amœbic factor as a cause of acute dysentery was a minimal one.

HAS THIS PROPORTION OF AMŒBIC TO BACILLARY DYSENTERY ALWAYS BEEN MAINTAINED DURING THE LAST THREE YEARS?

I do not think from what Captain Willmore [12] and myself have already written, as well as from opinion expressed by others, that the amœbic as a cause of invalidity and death has ever been the preponderating one in the Egyptian War Zone during the last three years.

I have only performed during that period three post-mortems on cases of amœbic dysentery (diagnosed both ante and post mortem) as against eighty-one bacillary autopsies; and after all the post-mortem room is the temple of Truth.

Relatively more amœbic cases have been noted amongst European troops during the winter and spring months when the bacillary disease (probably owing to the absence of houseflies) is in abeyance. As a general rule it has been noted that the number of amœbic cases increases some four to six weeks after troops have moved forward into new country and have drunk unsterilized water, as seems to have happened in the recent Jordan Valley operations.

The impression left on one's mind is that the amœbic infection is acquired by armies on the march, while the bacillary disease is essentially one of standing camps.

WHAT ARE THE DISTINCTIONS WHICH CAN BE MADE OUT BETWEEN THE STOOLS OF THE TWO FORMS OF DYSENTERY?

As a result of continuous observation I can present the following statement:—

Acute bacillary stool.

- (a) Pure blood and mucus.
- (b) Mucus tinged with bright red blood throughout; viscid adhering to bottom of pan.
- (c) Odourless.
- (d) *Microscopically*, undamaged pus cells and endothelial macrophages predominate. Few bacilli visible.

An acute inflammatory exudate derived from the mucosa of the whole, or major part, of the large intestine.

Acute amoebic stool.

- (a) Blood and mucus intermingled with faeces.
- (b) Fluid mucus; blood generally dark red, occurring in streaks or clots.
- (c) Strong foetid odour, probably due to bacterial contamination.
- (d) *Microscopically*, fragmented pus cells, endothelial macrophages scarce, red cells in rouleaux. Large number of bacilli visible.

Derived from the bases of sloughing, discrete ulcers, together with an inflammatory exudate and intermittent hæmorrhages from the bases of these lesions.

ON WHAT FACTORS DOES THE SUCCESSFUL ISOLATION OF THE BACILLUS DYSENTERIÆ DEPEND?

Factor I.—Period of the Disease.

In ten cases of bacillary dysentery of average severity, whose stools I have been able to culture daily, I have never been able to isolate the specific bacillus after the sixth day of the disease, even when the exudate continued mucoid. This fact has long been known, but I do not think it is generally appreciated. Heffermann and Seligmann, in 1916, Martin and Williams, in 1918, have called attention to the same fact.

In one case I was able to isolate Shiga's bacillus from the faeces three months after the primary attack, but this was a genuine relapse case, and was passing blood and mucus at the time.

Factor II.—Even from suitable stools it is not always possible to isolate the bacillus at the first attempt.

Ten Broeck and Norbury [17] have pointed out that nearly one-third of their total number of positive isolations were obtained after the second, third, and fourth attempts. I have had some striking cases in this respect. In a most acute and rapidly fatal case the first stool, though apparently suitable in every respect, gave an abundant growth of *proteus*, but just before death a luxuriant culture of Shiga's bacillus was obtained from the stool, as well as from the cæcum and sigmoid post mortem.

There have been three other extremely acute cases in British soldiers, who eventually recovered, in whom I have had a similar experience.

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Conversely I have been able to record a case in which on the first attempt twenty per cent of the colonies on the plate were those of Shiga's bacillus, while on the very next day and subsequently no other colonies of this bacillus were ever again detected.

Factor III.—Failure to isolate the specific bacillus from the stools during the lifetime does not necessarily indicate that it is non-existent in the intestinal canal of the patient.

This also has been a comparatively common event and will be discussed further under Pathology. I have had three very acute cases in British soldiers in which, owing probably to the gross bacterial contamination of the stools before death, Shiga's bacillus could not be isolated. In one case it was isolated from the deeper necrotic layers of the sigmoid and from two others from the raw granulating surface beneath the dead and exfoliating mucous membrane.

In 14 fatal cases of chronic bacillary dysentery amongst Turkish prisoners I have succeeded in isolating specific bacilli (8 Flexner-Y, 6 Shiga's bacillus) from the bases of the typical ulcers in the large gut. These were all chronic cases of over one month's duration passing faecal diarrhoeic stools during life, from which I had been unable to isolate the bacillus. Most of the cases were complicated by other diseases, such as pellagra and tubercle.

Factor IV.—The successful isolation of the bacillus depends upon the nature of the cellular exudate.

From a simple microscopical examination it is possible to prophesy whether culture will be attended by success. The most promising specimen for this purpose consists of undamaged pus and red cells with a considerable proportion of macrophage endothelial cells.

TABLE I.

Nature of stool	Number cultured	Shiga isolated	Flexner-Y isolated	Percentage isolated
I.—(a) Fresh gelatinous blood-stained mucus. <i>Microscopically</i> —Pus cells, red cells, macrophage cells, few bacilli. <i>Entamoeba</i> absent	109*	39	41	73.4
(b) Fresh gelatinous blood-stained mucus, disintegrating pus cells, red cells, no macrophage cells, few bacilli. <i>Entamoeba</i> absent	39	14	13	69
(c) Gelatinous blood and mucus, disintegrating pus and red cells, numerous motile bacilli seen. <i>Entamoeba</i> absent	29	9	4	44.8
II.—Glairy mucus, no blood; pus cells and macrophages. <i>Entamoeba</i> absent	8	1	4	62.5
III.—Bile-stained blood and mucus, disintegrating bile-stained pus cells and red cells	10	2	1	33
IV.—Blood and mucus mingled with faeces	19	4	3	36.7

Four plates sown on one occasion showed 80 per cent. of colonies were those of *B. dysenteriae*.

I have compiled the preceding table. From it one can gather that the more the mucus is contaminated with bile or fæces the less likely will be the successful isolation of the bacillus.

From a purely fæcal stool I never succeeded in isolating a true dysentery bacillus. Fletcher [8] has described one true carrier of Shiga's bacillus in a fæcal stool, and he appears to have found some eighteen carriers of the Flexner-Y group.

Whitehead and Kirkpatrick [6] who did their work in Egypt during the same period as this investigation was made never succeeded in isolating Shiga's bacillus from a fæcal motion and the Flexner-Y bacillus under such circumstances on two occasions only. It would therefore appear to be a waste of time to attempt to do so during routine *field laboratory* work. At the best it is like looking for a needle in a haystack.

I have never been able to satisfy myself that I have encountered a genuine case of mixed amœbic and bacillary infection, although others appear to have done so [18].

With this point in view I have cultured every suitable blood and mucus amœbic stool only with a negative result. Willmore and Shearman appear to have been more fortunate in this respect.

What is the Significance of the Cellular Exudate in Bacillary Dysentery?—The pus cells and red cells are derived from the acutely inflamed mucosa partly by diapedesis and partly by actual hæmorrhage as can easily be demonstrated in sections of the gut. The endothelial macrophage cells have often been described. I figured and investigated them in my work on dysentery in Fiji in 1910 [4].

I then regarded them as the characteristic cell of the bacillary stool, though I recognized that they might also occur in limited numbers in an amœbic exudate. They have since been well described by Wenyon and O'Connor [19]. They are undoubtedly macrophage endothelial cells derived from the capillary endothelium of the large gut [12] and may be found in microscopic sections of the submucosa as described by Willmore and myself. There still seems to exist a certain amount of confusion in some minds as to their exact significance and they have apparently been thought to be of protozoal origin [20] (Thomson and Thomson).

One has to remember that these cells when passed in the stool are defunct and therefore undergoing rapid disintegration. Being in a fluid medium they have swollen up, their nuclei are breaking down; this accounts for their very varied appearance and degree of refractility.

My own observations during the last three years show that the various stages of an acute attack and the pathological condition of the intestine may be inferred from a study of the cellular changes in the exudate, thus:—

Stage I, lasting the first three days of the disease.—Preponderance of pus cells, fresh red cells, macrophage endothelial cells with ingested red cells, intestinal epithelial cells, calcium phosphate crystals; few visible micro-organisms.

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Stage II, lasting subsequent three days.—Disintegrating pus cells, red cells, bile-stained columnar epithelial cells, disintegrating macrophage cells, calcium phosphate crystals; many micro-organisms visible.

Stage III, lasting three days or more.—Disintegrating red cells, free hæmatoidin crystals, many degenerated pus cells containing fatty particles with active Brownian movement, large numbers of motile micro-organisms, often flagellates—*Tetramitus* or *Trichomonas*, the former with ingested red cells.

A high proportion of macrophage cells is to be regarded as of good prognostic import, their absence throughout inversely indicates a very severe or it may be fatal attack, especially is this so if the pus cells are much disintegrated from the start or intensely stained with bile.

Factor V.—Under tropical conditions the specific bacillus cannot be isolated from the stool after it has decomposed for four hours.

Experiments were made with seven freshly-passed stools in specially cleansed enamel bed-pans with well fitting lids.

In four of these seven Flexner-Y and in three Shiga's bacillus were numerically the preponderating organisms.

The pans were placed in a corner of the field laboratory (average temperature 90° F.) and were cultured at hourly intervals for four consecutive hours. At the end of that time the plates were overgrown with *proteus* organisms and lactose-fermenters of the *coli* group, but not a single colony of the dysentery bacillus could be detected.

Another experiment on similar lines was conducted in this manner. The freshly passed stools of eight acute cases were cultured and dysentery bacilli isolated from every one (i.e., 100 per cent)—four Shiga and four Flexner-Y. The stools were allowed to stand in the laboratory overnight at a temperature between 60° F. and 70° F. for eight hours, after which they were recultured with the result that specific bacilli were isolated from three only, i.e., 37·7 per cent.

Factor VI.—Successful isolation depends upon absence of urinary contamination and the nature of the contaminating organism.

I have never been able to isolate specific bacilli from stools grossly contaminated with urine. The dysentery bacillus is a delicate organism and cannot compete with more rapidly growing and luxuriant bacilli such as *B. coli*, *proteus* and especially *B. pyocyaneus*. This latter bacillus is an extremely common concomitant in bacillary stools, especially when they are at all decomposed. That it exerts an inhibitory action on the dysentery bacilli has been shown by artificial inoculation of the two organisms on to agar, as well by its action on dysentery colonies on a McConkey plate where contaminated by *B. pyocyaneus*.

The infrequency with which *B. pyocyaneus* occurs in bacillary dysentery stools would seem to suggest that no such entity as a primary dysentery

due to this organism exists, but when it does occur in culture in great profusion it is to be regarded as a secondary invader. It is therefore permissible to suggest whether the epidemic of *pyocyaneus* dysentery as described by Calmette [21] and Maggiora and the case described more recently by Candido [22] do not admit of the same explanation.

YEASTS AS SECONDARY INVADERS OF A DYSENTERY STOOL.

I have on two occasions found yeast cells and mycelium (probably *Monilia albicans*) the predominant organism in the stools of a debilitated and chronic bacillary case; there was at the same time a deposit of "thrush" in the mouth.

The principles enunciated in this section have already been emphasized by Handmann [27], Hummel [28], and Martin and Williams.

PARADYSENTERY BACILLI.

The terms "para or pseudo dysentery" bacilli have been applied recently by numerous authors to organisms which, while resembling in their morphological and cultural characters dysentery bacilli, differ from the typical organisms to some degree in their biochemical reaction.

Most of the communications which have appeared in print deal with the so-called aberrant forms of the Flexner-Y group, though several investigators including Smartt [10], Pirie [23], Sonne [24], Roussel, Brulé, Barat and Pierre-Marie [18], Delille [25], Paiseau and Lemaire, Negre [26], Sergent and Foley, deal with gas-producing organisms which bear no obvious biochemical relationship to true dysentery.

Sternberg [29] considers that there are three types of mannite fermenting strains inagglutinable by Flexner-Y sera, but his argument that because they are the predominating organism in certain plate cultures necessarily indicates that they are the cause of the disease is surely a fallacious one. Martin and Williams [16] have also expressed the view that there are inagglutinable strains of mannite-fermenting organisms.

Similar arguments can be adduced in respect of the organism described by Bertillon [30], and d'Hérelle. Remlinger [31] has described a bacillus giving similar biochemical reaction to Shiga's bacillus, but motile, as a cause of acute dysentery. Schmitz [37] has described a Shiga-like indol-producing bacillus.

Latterly Andrewes [32] has described three organisms, *B. ambiguus*, *B. alkalescens* and *B. dispar*, the former being nearly related to Shiga's and identical with Schmitz's organism, the latter two to the Flexner-Y bacillus. These atypical strains he does not regard as the cause of dysentery; they, therefore, hardly merit the designation of para or pseudo dysentery bacilli. My experience coincides with that of Whitehead and Kirkpatrick, that in every suitable case true dysentery bacilli can be recovered, that *these atypical or para-dysentery organisms are in reality concomitants or products of decomposition of either a stale specimen*

or are derived from the gut in an advanced stage of the disease at a time when the true specific organism can no longer be recovered. The evidence for this statement is as follows: (Table II). Four Shiga and four Flexner-Y dysentery stools were allowed to decompose for four hours at 90° F., and the following bacilli were obtained non-agglutinable by Shiga or Y serum, but producing somewhat similar sugar reactions. Nos. A 1 and B 3 are possibly the Shiga-like organisms described by Remlinger [31]; see the accompanying table.

It would simplify matters greatly were the prefixes "*para*" and "*pseudo*," in connexion with nomenclature of dysentery, dropped entirely.

TABLE II.

A.—Experiments with Shiga Stools.

	Agglutination	Glucose	Lactose	Saccharose	Mannite	Dulcitol	Indol	Motility
Originally isolated Shiga bacillus	1-800	A	—	—	—	—	—	—
(1)	0	A	—	—	—	—	—	+
(2)	0	A	—	A	A	—	+	—
(3)	0	A	A	A	A	—	+	—
(4)	0	A	A	—	A	A	+	—

B.—Experiments with Flexner-Y Stools. (These stools were treated in a similar manner and the following inagglutinable organisms isolated.)

	Agglutination	Glucose	Lactose	Saccharose	Mannite	Dulcitol	Indol	Motility
Originally isolated Y bacillus	1-400	A	—	—	A	—	+	—
(1)	0	A	—	—	A	—	+	—
(2)	0	A	—	—	A	—	+	+
(3)	0	A	—	—	—	—	—	+
(4)	0	—	—	—	—	—	—	—

Organism A (1) resembles in biochemical reactions a *motile* Shiga's bacillus as already described above. B (1) and (2) give the reactions of an inagglutinable Y bacillus, while B (4) is obviously a *B. alkaligenes faecalis*.

Transmission of Bacillus dysenteriae.—The mode of conveyance of the dysentery bacillus from one man to another in camps on the desert used on the lines of communication is a subject by no means so simple of explanation as is the conveyance of organisms of the *enterica* group. In the first place, as I have already discussed the fact that the carriers of *B. dysenteriae* (specially Shiga's bacillus) in faecal motions are extremely rare and when they do occur this bacillus exists in but small numbers in comparison with other organisms of intestinal origin. In the second place it would seem that after passage of a dysenteric motion, especially as must occur in the open desert exposed to the sun, the *B. dysenteriae* becomes rapidly overgrown and killed off by other putrefactive organisms. Hence, in order

to get a gross contamination of a water supply with this organism, it would be necessary to mingle with it fresh dysenteric stools; but no such contamination has been possible in Sinai or Palestine at any rate. All the drinking water is pipe-conveyed and chlorinated before use and is, practically speaking, bacteriologically sterile. The same surely holds good of the food supplied to the troops. Suspicion then falls upon that universal pest, the house-fly, for the following reasons. As previously experienced in Fiji in 1910: (1) Epidemic bacillary dysentery has a definite seasonal incidence; (2) the seasonal incidence coincides with the maximum prevalence of the house-fly; (3) the evidence of this war has shown that in fly-infested zones, such as Gallipoli, epidemic dysentery has prevailed in the most intense form.

Previously in 1910 I had been able to demonstrate the existence of Shiga's bacillus in the intestinal tract of wild-caught house-flies and I was able in November, 1917, to repeat this experience on the Palestine front. The insects were caught in the open, in a spot where, as far as I could ascertain, they had not had access for several months to dysenteric motions. The only faecal contamination possible was from stray deposits by natives along the railway track.

The flies were caught by means of a wire gauze trap and were chloroformed and dissected in batches of ten. The bodies were singed in a flame and by means of sterile dissecting needles the lower part of the gut was drawn out of the abdomen on a sterile slide. These viscera were then emulsified in two cubic centimetres of sterile peptone water. For plating five drops of the emulsion from a pipette were spread on a six-inch MacConkey plate. From four out of these ten batches Shiga's bacillus was isolated. The bacillus was not easy to find scattered amongst many lactose fermenting colonies. On one plate there were as many as five colonies. All these bacilli from these flies even agglutinated as high as 1 in 800 by specific Shiga serum and all gave typical biochemical reactions. One in particular gave an agglutination titre up to 1 in 1200, and has been utilized as a stock culture ever since.

Many fresh injections of acute bacillary dysentery caused by Shiga's bacillus were occurring in that particular locality at that time. The inference therefore is that infection of food was taking place through faecal contamination by the house-fly.

AN ACCOUNT OF THE PATHOLOGY OF ACUTE AND CHRONIC BACILLARY DYSENTERY AND ITS BEARING UPON THE BACTERIOLOGY OF THE DISEASE.

(A) *The Pathology of the Acute Disease.*

B. dysenteriae inhabits the large gut where its toxin exerts a selective action upon the mucosa much in the same way as *B. diphtheriae* has a similar action upon the mucous membrane of the mouth.

Should the toxin of *B. dysenteriae* be very virulent or produced in great

amount, it primarily causes the most intense inflammation of the mucous surface. This I propose to term Stage I; and is followed shortly after by colliquative necrosis of the whole mucosa in which all traces of glandular structure are lost and in which the dead tissues become permeated with bile and stained green by it; this is the condition I propose to call Stage II. Death at either of these stages takes place from toxæmia. Stage III consists of the exfoliation and expulsion *per anum* of this necrotic tissue, leaving a bare granulating surface underneath. The patient then presumably dies of exhaustion.

It is now my purpose to show what becomes of *B. dysenteriae* in these three stages and how best it may be isolated from the intestines. In this acute stage Shiga's bacillus was generally the underlying cause; in one acute case only was the Flexner-Y bacillus isolated.

I have had the opportunity of examining twenty-four cases at autopsy and of making cultures from the intestines, and of culturing and examining microscopic sections.

These were all acute cases, that is, a fatal termination ensued three weeks after the commencement of the attack and which naturally involved the destruction of large tracts of the large intestine.

Seven of these cases occurred in British soldiers, sixteen in Turks and one in a German prisoner.

Stage I: Cases with the most acute Inflammation of the Large Gut.

I have investigated five; in these death took place at intervals varying from fifty-six to one hundred hours from the initial attack. In one case, that of the German prisoner, a complication of valvular disease co-existed with splenic and renal infarcts. The appearance of the patient was toxæmic and often choleraic; from the start there was little actual abdominal pain, though the tenesmus was intense; the skin was cold and clammy; face flushed and cyanotic; hiccough, vomiting, husky voice, a marked feature; in some cramps in legs; pulse small and rapid. The stools were frequent from the start, microscopically consisting of broken-up pus cells, and red cells in rouleaux; macrophage cells were absent. Macroscopically they consisted either of rice water fluid or liquid mucus with a large proportion of dark blood.

Post-mortem.—The bodies were not emaciated; there was engorgement of right heart, general lymphoid peritonitis with flocculi of lymph on surface and free serous fluid in peritoneal cavity; injection of intestinal capillaries; paralytic distension of large gut; great injection of lower two feet of ileum; superficial necrosis of Peyer's patches; red, diffuent and occasionally hæmorrhagic mesenteric lymph glands; large engorged liver and a diffuent dull red 10-ounce spleen with tense capsule, gall-bladder full of dark viscid bile.

Shiga's bacillus easily isolated in the four cases in which culture was attempted from the transverse colon and sigmoid. Scrapings were made from inflamed surface by means of a platinum loop and spread upon a MacConkey plate. *B. proteus* and a few lactose-fermenting bacilli were the chief contaminating organisms.

Cultures from heart, blood, liver, spleen, bile and mesenteric glands all proved sterile.

Microscopic sections explain the absence of macrophage cells in the stool, as they cannot be found in sections (the inflammatory process has probably been of too short a duration for them to have formed). There are few changes in the muscular coats or submucosa, but a great part of the mucous membrane has been obliterated, and all traces of glandular structures destroyed. This layer is represented by cell infiltration and numerous hæmorrhages. The polymorph cell predominates in the exudate. In suitable stained sections bacilli can be seen lying directly beneath the free surface.

Stage II: Cases with Colliquative Necrosis of the Mucous Membrane of the Large Gut.

Of these I have investigated 15 (4 in British soldiers and 11 in Turks). Death took place in seven to ten days from the initial attack. The small intestine, especially the ileum, was implicated for the last two feet in four. In one instance the whole of the ileum was necrotic, and the jejunum was acutely inflamed. (In 4 Turkish cases other complicating diseases co-existed, such as pellagra, tubercular deposits in lungs, 2 cases, renal calculus and hydro-nephrosis, 1 case.)

The appearance of the patient much resembled that already described. The temperature at the commencement of the attack was irregularly raised, but was subnormal towards the end. Abdominal pain was most severe. In three cases there was *balanitis*. Rapid emaciation was a marked feature. The stools which at first consisted of bright red blood and mucus became liquid, hæmorrhagic and foul smelling, with dark green bile-stained flocculi. The exhaustion was extreme, and death took place from collapse. Microscopically towards the end no cellular elements, save much crenated red cells, were visible in the stools (this fact is easily explicable from a study of the sections in which the necrotic mucosa appears as an impermeable membrane); in one case no blood or mucus was passed during the last four days of life; the stools consisted of offensive diarrhoea, with a content of decomposed blood.

Post-mortem.—The bodies were emaciated with absence of subcutaneous fat. The right heart was distended with blood. Post-mortem intussusception of the small intestine was a feature, the ileum was implicated generally. The peritoneal surface of the large intestine was dull; the appendices epiploicæ were large and inflamed; cedema of the large gut was marked; there was thickening and great contraction of the walls of the large intestine. Necrosis of the mucosa with formation of dark green membrane pitted on the surface and hard to the touch, or plum-coloured discoloration was present in ten cases throughout the length of the large gut; in four cases it affected the sigmoid colon and rectum, and in two the rectum alone. There was engorgement of the liver with parenchymatous degeneration and slight enlargement of the spleen. The average weight of the former was fifty ounces, while that of the latter was eight and a half ounces.

Cultures were made from the surface of the necrotic membrane, but in no case was a dysentery bacillus recovered. It was otherwise when the surface was seared and incised with a sterile knife. A platinum wire was inserted

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through this incision and a loopful of serous fluid removed. By this means cultures of dysentery bacilli were recovered (*in six cases Shiga and in one case Flexner-Y*). Cultures from heart, blood, spleen, liver and lymphatic glands were sterile.

Microscopic sections showed that the mucosa had become converted into a hyaline substance, in which all traces of organized structures were lost; in the lower layers were scattered a few pyknotic nuclei of polymorph cells. Underneath the muscular mucosa were large numbers of these cells. The sub-mucosa showed great œdema and hæmorrhages with numerous endothelial macrophage cells with ingested red cells and polymorphs. The small intestine when affected showed similar changes. In some sections the hyaline change was not so marked as in others, and in these numerous round cells and partially destroyed polymorphs could be distinguished in the upper layers of mucosa. The lesson to be learned from this is that the *whole* mucosa had been destroyed *en bloc*. Rod-shaped organisms were visible only in the necrotic layers. Sections of the spleen and liver showed general toxic spoiling and focal necrosis.

Stage III: Cases with Exfoliation of the Necrotic Mucosa.

I have been able to investigate four of these cases, all occurring in British soldiers who died between the third and fourth week of the disease. The clinical appearances resembled those of Stage II, except that they died in a state of exhaustion, having passed the major part of the necrotic mucous layer *per anum*. The bodies were very emaciated and the tissues were drained of fluid. The necrotic mucosa could be detached with forceps from off the underlying granulating surface just like a diphtheritic membrane.

In these cases Shiga's bacillus was isolated by scraping the *granulating surface* with a platinum loop.

Microscopic sections showed granulation tissue on the surface. An œdematous submucosa with collagenous fibres and fibroid casts and infiltration with plasma cells. The desquamating necrotic mucosa appeared as a hyaline membrane containing a few much disintegrated pus cells.

These pathological investigations have a distinct bearing upon the bacteriology of the disease *in its acute form*. They show:—

(1) That from Stage I the bacillus can be isolated from the free mucous surface.

(2) From Stage II it can be isolated only from beneath the necrotic layer.

(3) From Stage III it can be isolated only from the granulation tissue beneath the desquamated necrotic membrane.

(B) The Pathology of the Chronic Form of Bacillary Dysentery and its Bearing upon the Bacteriology.

Most of the cases with chronic intestinal lesions occurred in Turkish prisoners of war, in whom, for the most part, the dysentery had been of long standing and presumably untreated. The disease occurred as an

infection superimposed upon some other chronic diseases such as tuberculosis and pellagra. I was able to study the pathological lesions in 55 cases (52 of which were in Turks and 3 in British soldiers). In every case of these 55 there was a long history of chronic diarrhoea with intermittent passage of blood and mucus of over four weeks duration. As a rule this history extended over a variable period from five weeks to five months. Being associated with such a variety of other diseases the clinical appearances of the patients during their lifetime were equally varied. Emaciation, however, was extreme, and in some a terminal ascites with oedema of the legs supervened.

In the pellagra cases, for instance, the existence of dysenteric lesions of the gut was hardly suspected during life, as diarrhoea and faecal incontinence were looked upon as a late manifestation of that disease.

Ulceration.—The pathological condition consisted of necrosis of limited parts of the mucous membrane of the large gut, involving, as a rule, the mucous membrane as far down as the submucosa and muscular tissue has been seen *with perforation of the intestine*. One important point seems to be that with all this ulceration there is little attempt at a compensatory thickening of the gut wall. The character of the ulcers and their differentiation from the amoebic form I have tabulated as follows:—

Chronic Bacillary Ulcers.

Commencing at free edge of *valvula conniventes* and their distribution is transverse to the long axis of the gut.

Serpiginous in outline with ragged undermined edges—often intercommunicating with neighbouring ulcers, involving mucous membrane and muscularis mucosae as a rule.

Bases consist of granulation tissue.

Affect large intestine and sometimes last two feet of ileum as well.

Intervening mucous membrane injected and plum-coloured.

No compensatory thickening of gut wall.

Amoebic Ulcers.

Ulcers commence in solitary follicles and run parallel to long axis of gut.

Ulcers oval in shape, regular in outline, discrete; flask-shaped on section, involving mucous membrane, submucosa and muscular coats.

Bases consist of thick, greenish or yellowish sloughs projecting above the free surface of the mucous membrane.

Discrete ulcers scattered throughout large intestine from caecum to rectum. Small intestine never affected.

Intervening mucous membrane not affected.

Compensatory thickening of gut wall.

This description of chronic bacillary lesions tallies with the text-book ones given by Rogers [33], Shiga [34], and Ruge [35].

Of these 55 cases the portions of the gut affected were as follows: Whole large intestine involved, 24 cases; caecum and transverse colon alone, 1 case; rectum, sigmoid and transverse colon, 3 cases; rectum, pelvic colon and sigmoid only, 17 cases; sigmoid flexure alone, 5 cases; rectum alone, 5 cases.

The tendency is for chronic bacillary ulceration to affect the lower part

of the intestine, such as the sigmoid colon and rectum. In the upper parts of the large intestine the ulcers are generally shallower, and increase in depth and extent towards the lower end. In two cases chronic bacillary ulcers were present in the lower part of the ileum, and dysentery bacilli were isolated from them: both these cases had a tubercular ulceration of the gut as well, from scrapings of which tubercle bacilli were identified.

Mucous Cysts.—Three cases exhibited large tapioca-like mucous retention cysts distributed throughout the large gut. They jutted out as jelly-like mounds on the mucous surface, from which clear viscid mucus could be expressed. From one of these cysts Shiga's bacillus was isolated—that is, not from the contained mucus but from the surface of the mucous membrane just superficial to it. The production of these mucous cysts in the chronic bacillary gut goes far to explain the existence of a post-dysenteric mucous colitis and its incurable character.

Polypoid Growth.—In one case long polypoid growths (three-quarters to one inch in length) were scattered densely throughout the rectum. These out-growths were vascular and some contained actual hæmorrhages. From the surface of the mucous membrane Shiga's bacillus was isolated.

CHRONIC BACILLARY DYSENTERY AS A TERMINAL INFECTION.

Of these fifty-five cases ten were uncomplicated by any other disease; they apparently died of exhaustion. Seventeen were complicated by pellagra (six of these had also *B. coli* abscesses in the kidneys), one with pulmonary tubercle, and one with a membranous growth of *Monilia albicans* in the mouth and œsophagus. Eighteen were complicated by tubercular deposits in lungs and one in the spleen as well, while two had tubercular ulceration of the small intestine. Four were complicated with malaria (both benign and subtertian), three were complicated by lobar pneumonia, one with scurvy, one with *B. coli* abscesses of kidneys, one with paratyphoid B (isolated from gall-bladder and from ulcers in small intestine). In one case death was apparently caused by perforation of an ulcer in the sigmoid at the level of the sacroiliac synchondrosis; three other ulcers were on the verge of perforation.

The average weight of the spleen was eight ounces (this is not to be taken as a true indication of the amount of wastage of all the organs, as splenitis with thickening of the capsule and deposit of melanin suggested old-standing malaria in many instances).

The liver, on the other hand, was much wasted, average weight being forty-one ounces.

Bacteriology.—Dysentery bacilli were only isolated from the bases of the ulcers in the following manner:—

- (1) The gut was washed well in sterile water.
- (2) The base of the ulcer was scraped with a sterile knife.

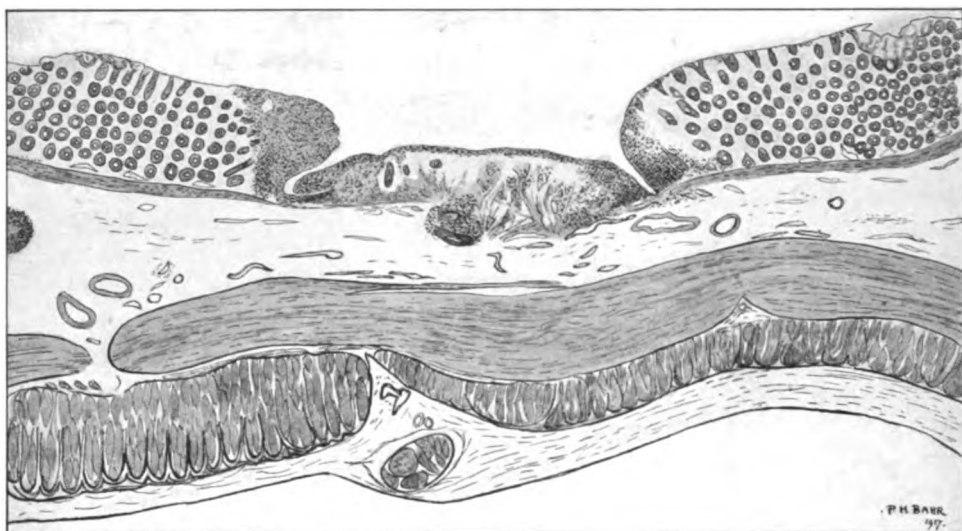


PLATE I.

Microscopic section of chronic bacillary ulcer (*Y bacillus*). Sigmoid colon. Note the undermined edges of the ulcer, the granulation tissue, rupture of the muscularis mucosæ, the downward growth of fundi of Lieberkühn's follicles.

- | | |
|------------------------|---------------------------------|
| (1) Mucosa | (4) Circular muscular coat. |
| (2) Muscularis mucosæ. | (5) Longitudinal muscular coat. |
| (3) Submucosa. | (6) Peritoneal coat. |

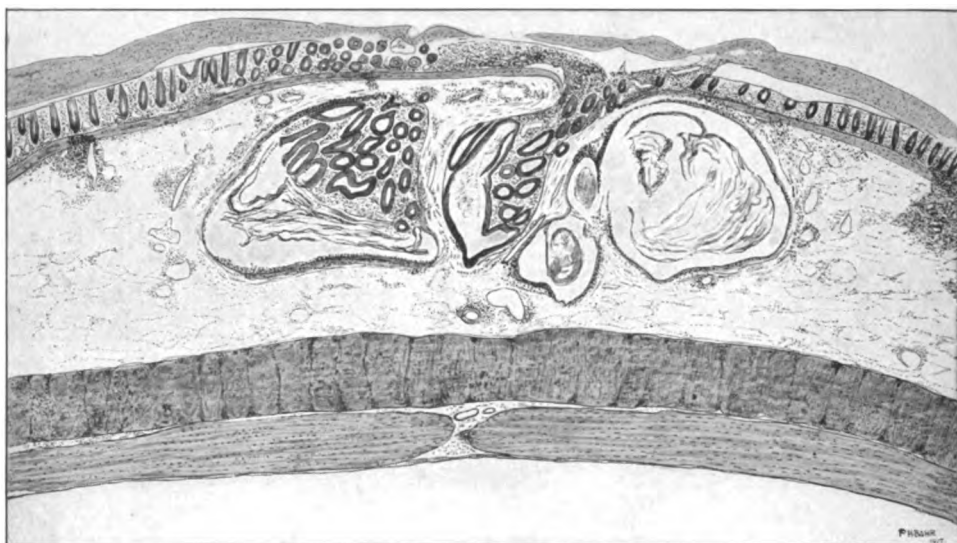


PLATE II.

Microscopic section of chronic bacillary ulcer (*Shiga's bacillus*) of rectum with subjacent mucous retention cysts and adenoma of Lieberkühn's follicles.

- | | |
|----------------------------------|-------------------------------------|
| (1) Superficial necrotic slough. | (4) Submucosa with retention cysts. |
| (2) Mucosa. | (5) Circular muscular coat. |
| (3) Muscularis mucosæ. | (6) Longitudinal muscular coat. |

To illustrate "The Correlation of the Pathology and Bacteriology of Bacillary Dysentery,"
by Brevet Major P. MANSON-BAHR, D.S.O., R.A.M.C.(T.C.).

(3) It was then seared with a hot knife.

(4) A platinum wire was inserted under the edge of the ulcer and some blood-stained fluid removed and spread upon a MacConkey plate.

Culture could not be carried out in every case. Out of 20 attempts dysentery bacilli were isolated in 14 (6 Shiga's bacillus, 8 Flexner-Y). Therefore in contradistinction to what obtains in the acute disease, the Flexner-Y bacillus would appear to be the commoner organism in the chronic forms.

To exclude the possibility of any of these ulcers being amoebic in origin scrapings were made and examined for protozoa and sections of the ulcers were cut and stained for these organisms.

MICROSCOPIC PATHOLOGY OF THE CHRONIC ULCER.

Plate I gives an idea of the structure of such a chronic ulcer in the large intestine. On the surface of the ulcer there is a zone of necrosis and beneath it a zone of granulation tissue. The muscularis mucosæ is partially destroyed and replaced by plasma cells and fibroblasts. Although the more superficially situated follicles have been destroyed, there are in certain sections downward growths of the fundi which can be seen penetrating the submucosa and forming a veritable adenoma (Plate II). I have been able to trace in different sections all stages between the chronic ulcer and the fully developed adenomatous mucous retention cyst. The only previous description of these cysts in chronic dysentery which I can find is in Davidson's "Hygiene and Disease of Warm Climates," 1893 [36.] I think from my study of microscopic sections that, if systematically searched for, these cysts will be found to be quite a common occurrence in chronic dysentery. I have numerous microscopic sections of small adenomata growing beneath chronic ulcers where their existence was not suspected at the post-mortem.

Plate II sufficiently explains this condition; from the granulation tissue immediately overlying the cyst Shiga's bacillus was obtained. The downward growth of Lieberkuhn's follicles is well demonstrated with the formation of cyst cavities lined with columnar epithelium. In the more mature cysts this epithelium appears to have been destroyed and the cavity is lined merely by a basement membrane. Dysentery bacilli were not recovered from the viscid mucus contained within the cyst. Some of the older cavities are filled with polymorph cells, and, apparently, should they become invaded by pus forming organisms, an abscess can form within the bowel-wall. This was actually noted in one case and *B. coli* was recovered in pure culture from the pus. The isolation of the specific bacillus from these chronic lesions is by no means such an easy matter as in the acute stages. This fact can be explained (a) by the paucity of the bacilli; (b) by the existence of numerous competing organisms, such as *B. coli*, (c) by the nature of the chronic pathological lesions induced.

Acknowledgments.—A work of this nature, extending over the last three years, has brought me into immediate contact with fellow-workers and medical officers too numerous to mention. In my capacity as patholo-

gist I have had the pleasure of serving under many commanding officers of medical units who have given me every assistance. My gratitude is especially due to Lieutenant-Colonel C. J. Martin, C.M.G., F.R.S.; Lieutenant-Colonel Gordon Hall, C.M.G.; Lieutenant-Colonel Conway, D.S.O.; and especially to Lieutenant-Colonel P. S. Vickerman, R.A.M.C., O.C. Prisoners of War Hospital, Cairo, and Captain John Anderson, R.A.M.C.; nor must I omit to mention the very valuable services of my laboratory orderlies Ptes. Goddard and Bartlett, R.A.M.C., who have given me their loyal and unstinted assistance.

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AN ACCOUNT OF AN INFECTION IN MESOPOTAMIA DUE TO A BACILLUS OF THE GAERTNER-PARATYPHOID GROUP.¹

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(A Report to the Medical Research Committee.)

A SERIES of inagglutinable organisms culturally and morphologically indistinguishable from *Bacillus paratyphosus* B have been isolated from the blood-stream by the writer in Baghdad, between July and December, 1918, and it is learned that similar findings have been recorded in a number of cases in other areas of Mesopotamia. In view of the bacteriological results obtained and pathological lesions revealed at autopsy in three fatal cases which occurred, an account of the findings along with a note on the clinical history of the series of cases, has been deemed worthy of record, to draw attention to the possibility of other cases of fever with or without marked pulmonary lesions being due to the same organism, as well as to raise the question of its relationship to the infections of the classical "enterica" group, especially paratyphoid B fever.

CHARACTERS OF THE ORGANISM ISOLATED FROM THE BLOOD AND FROM THE VARIOUS ORGANS.

The several strains of the organism under review all have the cultural and morphological characters of the Gaertner-paratyphoid group. It is most closely related to *B. paratyphosus* B and, as will be shown, it does not appear to belong to the *B. aertrycke* type. Up to the present the organism has been obtained from nine cases, from seven of which it was isolated during routine blood-culture investigation of "P.U.Os." In the remaining two cases it was isolated at autopsy from the lungs and spleen, no blood-culture having been carried out during life. The organism has so far not been isolated from the urine or stools in spite of numerous examinations, but at one of the autopsies it was obtained in pure culture from the bile. All the strains give similar microscopic appearances—an actively motile short, stout Gram-negative bacillus, or cocco-bacillus, with some tendency to pleomorphic formation. The growth on agar is less transparent and oily in appearance than the usual paratyphoid cultures, and is usually more profuse. There is no liquefaction of gelatine. On MacConkey's medium the colonies are indistinguishable from the paratyphoids. Biochemically the organism produces acid and gas in mannite, glucose, dulcitate, maltose, galactose and arabinose, no change occurring in lactose, saccharose and inulin. Litmus milk becomes at first slightly acid, changing to alkalinity on the fifth to seventh day; there is no production of indol.

¹ This paper was despatched from Baghdad in January, 1919.

SEROLOGICAL CHARACTERS.

On isolation all the strains were inagglutinable even in low dilutions of the high titre sera (Lister Institute) for *B. typhosus*, *B. paratyphosus* A, *B. paratyphosus* B and *B. enteritidis* (Gaertner). After eight subculturings in broth spread over a fortnight, all the strains had become agglutinable to para B serum in dilution of 200 and 250; while in the case of four of the strains, each of which was subcultured on thirty occasions, agglutination was obtained in considerably higher serum dilutions. Fine soft flocculi with a distinctly opalescent supernatant fluid were present in dilutions ranging up to 1,000 and 2,000 (titre of the para B serum 6,000) but marked sedimentation was never present in dilutions higher than 200 or 250. In none of the tests with para B serum did I obtain the clear supernatant fluid which usually results in similar tests with *B. paratyphosus* B. Consistently negative results were obtained in the agglutination tests with all the other high-titre sera (Dreyer's method slightly modified being the technique adopted).

Specific sera for three of the strains have been obtained by the immunization of rabbits, a titre of 6,000 to 10,000 being reached without any difficulty. All the nine strains were agglutinated to practically the full titre, whereas two stock strains of *B. paratyphosus* B never showed any signs of clumping, in higher dilution than 1 in 250. For example, strain No. 6 which was obtained in pure culture from the lungs at autopsy by plating the lung-juice on MacConkey's medium (as also from the heart blood and spleen), was agglutinated immediately after isolation by the rabbit immune sera for the strains Nos. 3 and 4 in dilutions of 8,000 and 10,000 respectively, while para B sera (Lister Institute, titre 6,000) failed to produce any reaction with this strain in dilution 1 in 50. "Zones of inhibition" were occasionally met with in the agglutination experiments both with the specific para B serum as well as with the sera obtained from the immunized rabbits, but no reference need be made to them in the present connexion.

It has, unfortunately, not been possible to obtain from England subcultures of recognized *B. aertrycke* strains, but through the kindness of Lieutenant-Colonel Ledingham, R.A.M.C., I was enabled to compare the reactions of a strain of presumed *B. aertrycke* isolated from an epizootic among guinea-pigs by Major Gloster, I.M.S., at Amara. The behaviour of this bacillus with the sera produced from the immunized rabbits was very different from that of all the nine strains of the organism under review. Agglutination with sedimentation was present up to the 250 dilution, while the same indeterminate type of clumping associated with the fine soft flocculi, as was obtained with the stock *B. paratyphosus* B, was present up to a dilution of 1 in 1,000. Nor did this *B. aertrycke* strain become more agglutinable after repeated subculturings, while it may be noted that it clumped with the Lister para B serum practically up to

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titre. Thus it appears improbable that the series of organisms under investigation belong to the *B. aertrycke* group, although the evidence is meantime incomplete in the absence of experiments with specific *B. aertrycke* sera.

AGGLUTINATION OF ORGANISM WITH PATIENT'S SERUM.

One Case, No. 1, is of special interest, in that it was possible to carry out agglutination tests with two lots of this man's serum against his own organism as well as against the others of the series. Unfortunately, no serum was obtained before the twenty-fourth day of illness. On this occasion the serum gave negative results. On October 28, 1918, i.e., the forty-second day from the onset of No. 1's illness, blood was again obtained and the following results were obtained in macroscopic agglutination tests with the serum against five of the strains and against our stock T.A.B. emulsions. This patient has been inoculated with T.A.B. vaccine in November, 1916, and again in February, 1918.

Strain				Dilutions of serum of Case No. 1					
				25	50	100	200	250	500
No. 1	++	++	++	±	±	-
" 2	+	+	±	-	-	-
" 3	++	++	+	±	±	-
" 4	++	++	+	+	-	-
" 5	++	+	+	-	-	-
Stock <i>B. paratyphosus</i> B	..			+	+	-	-	-	-
" " A	..			+	-	-	-	-	-
" <i>typhosus</i>	..			+	+	-	-	-	-

ABSORPTION TESTS.

Although it was not to be expected that much information was to be gained from absorption tests when the para *B.* agglutinogens of all the strains of the organism are relatively slight in character and produce such atypical flocculi as compared with those of the homologous organism, yet a number of such tests have been carried out. Out of six experiments with strain No. 4 immune serum, the following result was recorded in two instances :—

STRAIN No. 4, RABBIT IMMUNE SERUM (TITRE 6,000).

	Titre before and after absorption with <i>B. paratyphosus</i> B		Titre before and after absorption with Strain No. 3	
	Original titre	After absorption	Original titre	After absorption
<i>B. paratyphosus</i> B ..	250	< 50	250	< 50
Strain No. 4 ..	6,000	6,000	6,000	500
" " 3 ..	6,000	5,000	6,000	{ > 500 < 1,000

It is seen that *B. paratyphosus* B removed all the para B co-agglutinins from the rabbit immune serum, but did not touch the agglutinins for the homologous or similar organism; whereas after absorption with a presumably similar bacillus (strain No. 3) more than five-sixths of the agglutinins for the homologous organism were removed, as also were all the para B co-agglutinins. In the other four tests, such removal of the para B co-agglutinins by the strain presumably similar to the homologous organism did not occur. This may have been due to the use of an insufficiency of organisms in the saturation of the serum, although from the extent of the removal of the homologous agglutinins this does not appear probable. The atypical character of the flocculi present in the ordinary agglutination tests and the incompleteness of the reaction as shown by the persistent opalescence in the supernatant fluid may serve to throw some light on the inconstant results obtained, and further investigation in this direction is required.

In four experiments in which para B high-titre serum was saturated with strains Nos. 1 and 4, there was no absorption of the agglutinins for those organisms or for the homologous organism *B. paratyphosus* B. It is very probable, therefore, that we are dealing with a specific organism, the serological characters of which are quite distinct from those of *B. paratyphosus* B.

PATHOGENICITY TO ANIMALS.

No special experiments to test pathogenicity have been carried out owing to the small number of experimental animals available. Some observations were made, however, during the course of preparation of immune sera in rabbits. One animal, which had previously received two intravenous injections of 225 and 900 millions of dead bacilli, was found dead on the third morning after an intravenous dose of 500 million living organisms; while another rabbit died after 300 million live bacilli following on three doses of 300, 1,200 and 3,000 millions respectively of killed organisms, all given intravenously.

Post-mortem examination showed that both animals had died of a hæmorrhagic septicæmia. Petechial hæmorrhages were present on the pleural surfaces as well as in the substance of the lungs. Some were larger than petechiæ, and in the case of the second rabbit one extensive hæmorrhage involved a third of the right lower lobe. Small hæmorrhages were present in both spleen and kidneys.

The intestinal tract also showed lesions of considerable interest.

Discrete hæmorrhagic areas ranging in size from a pinhead to a millet seed were to be seen in the lower part of the duodenum, while in the jejunum and ileum they were well-marked over a length of three inches and extending in less degree for nine inches below. There was some associated œdema of the mucous membrane, but there was no naked-eye involvement of the lower part of the ileum or of the appendix. The great intestine appeared normal.

THE CLINICAL ASPECTS OF THE INFECTION WITH SOME NOTES ON THE MORBID ANATOMY.

The clinical history, etc., along with the post-mortem findings in the three fatal cases, is as follows:—

Case 3.—Pte. W., aged 30, was admitted to hospital at Baghdad on September 16, 1918, with fever, the temperature curve being suggestive of malaria, and the clinical symptoms of "influenza," of which there was an epidemic in Baghdad at the time. The man had been transferred from a convalescent camp, having been invalided from Persia for debility, following clinical malaria. No malarial parasites had been found previous to admission, nor were any detected during several examinations while the patient was in hospital. After five days intermittent temperature (98° F. to 103° F.) (see Chart I) there appeared definite signs of a right basal pneumonia, spleen being palpable on deep inspiration. Condition became very critical and six days later patient died. There was no paratyphoid eruption. Leucocyte count on day before death 12,000 per c.mm.

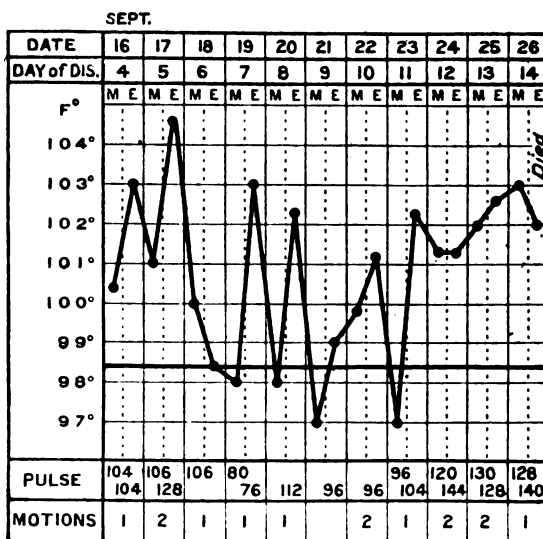
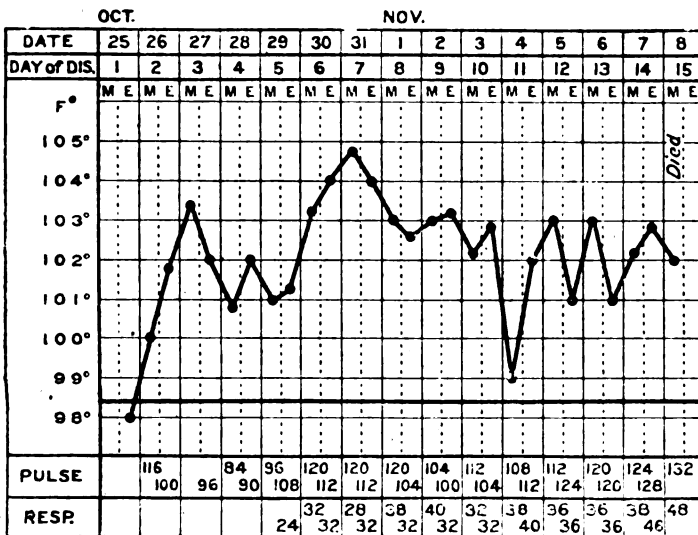


CHART I.—CASE 3.

Autopsy (ten hours after death).—Lungs: Right middle and lower lobes in state of grey hepatization; upper lobe acute congestion; left lung normal. Pleura: Right cavity contains eight ounces clear serous fluid, with a recent exudate of lymph over the affected lobes. Heart: Signs of dilatation. Myocardium soft and friable. Spleen: Twice the normal size, soft and diffuent. No pigment deposit to be seen by the naked eye or in smears. No malarial parasites detected. Intestines: Peyer's patches apparently perfectly healthy. Nothing abnormal seen in any part of the alimentary canal.

This organism was agglutinated by its homologous serum, obtained from an immunized rabbit in 1 in 6,000 dilution. Originally inagglutinable to all the specific sera; after numerous subculturings it reacted with para B serum (titre 6,000) as follows:—

Case 4.—Serjt. G., aged 40, had been twelve days in hospital suffering from vague nervous symptoms, having suffered from shell-shock in France in 1915, from which he had never completely recovered. Patient appeared to be doing well during his twelve days' residence, when his temperature suddenly shot up to 102° F. (see Chart II), and there developed symptoms of bronchitis and rhinitis. On the third day of fever signs of a right apical pneumonia developed. Five days later the right lower lobe and also the left apex showed signs of involvement. No suggestive rose spots were seen. Restlessness and delirium latterly became a marked feature, the patient dying on the fifteenth day of illness.



Autopsy (fourteen hours after death).—Emaciation slight with moderate hypostatic lividity. Pleura: Right sac contains eight ounces blood-stained fluid. No adhesions or lymph exudation. Left sac normal. Lungs: Consolidation of greater part of right lung, viz., whole of lower lobe, middle lobe and posterior portion of upper lobe. In section the colour was yellowish grey, the consistence distinctly friable, with a suggestion of softening, while there was a purulent exudate on squeezing the consolidated

areas. Left lung healthy, except for marked congestion, especially of upper lobe. Heart: Showed dilatation of the left ventricle with a large ante-mortem clot in the corresponding auricle. Myocardium pale, flabby, and easily friable. Spleen: Slightly enlarged, softish. Stomach and intestines (great and small): Normal in appearance except for a pink oedematous condition of the jejunum and upper part of the ileum. This may have been associated with the presence of several ascarides in the small intestines. Kidneys: Marked cloudy swelling, with some fatty changes.

Bacteriology.—Three blood examinations for malaria during life were all negative. Blood culture on the ninth day of illness gave a pure culture of a Gram-negative cocco-bacillus with the characters above described, while at autopsy the same organism was obtained from spleen, lung, and contents of gall bladder. Although originally inagglutinable, all four strains after a week's subculturing were agglutinated by para B serum in 1 in 2,000 dilution, tests with the other specific sera being negative. The serum of the animal immunized with this strain easily reached a titre of 10,000.

Smears from the sputum during life, as well as from the lung juice at autopsy, showed some Gram-positive cocci in addition to numerous Gram-negative bacilli, but no organism morphologically resembling the pneumococcus was seen.

Case 6.—Pte. D., aged 32, admitted to hospital on November 20, 1918, as suffering from anæmia, thought to be due to bleeding hæmorrhoids, gave a recent history of diarrhœa and colicky pains for the preceding twelve days. History of intermittent bleeding from the bowel during the previous two months was elicited, blood with clots being passed along with formed stool, while the occasional occurrence of prolapse on defæcation was reported.

Four days after admission patient developed a condition which was diagnosed as acute bacillary dysentery. Fever asserted itself so that the patient's temperature reached to 102° F. (see Chart III), while four to six non-fæculent motions were passed daily consisting chiefly of bright red blood associated with blood clots and a little mucus in the form of sago-like granules. Their appearance was altogether much more suggestive of intestinal hæmorrhage than of the usual acute dysenteric "B" and "M" stool. On microscopical examination the cytology did not suggest bacillary dysentery, very few cellular elements being present apart from blood-cells. No entamœbæ were seen, while on cultivation on MacConkey's medium on three occasions, no non-lactose fermenters were in evidence. Blood-films failed to reveal the presence of malarial parasites. The blood picture did not suggest a primary blood disease. The only striking feature was the pallor and distortion of the red cells, but no megalocytes or nucleated red cells were seen.

At first the sigmoid felt definitely thickened and was acutely tender, but

after several days this feature completely disappeared. The patient's general condition suggested marked toxæmia. He was treated with anti-dysentery serum, but no improvement ensued. On November 28, i.e., the twenty-first day of fever, severe watery diarrhœa set in, the stools being pea-soup-like with flecks of blood. On December 4, the temperature fell, collapse set in, patient falling into a comatose condition and death took place on December 6.

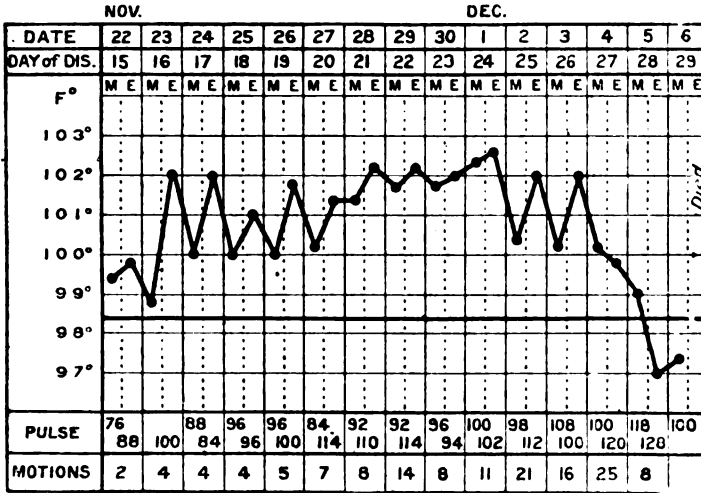


CHART III.—CASE 6.

Autopsy (performed twenty hours after death).—Body considerably emaciated; blood watery. Respiratory system normal. Cardio-vascular system: Pericardium normal; dilatation of right ventricle. Myocardium pale and fatty. *Nil* else of note. Alimentary tract: Stomach, small erosions in the mucosa. Lower part of duodenum and upper part of jejunum: Mucous membrane œdematous with signs of acute congestion. Scattered petechial hæmorrhages but no erosions. Ileum normal. Large intestine: Congestion of transverse and descending colon with numerous small erosions and hæmorrhages in the mucosa. No marked ulceration and no thickening present. Liver and kidneys: Marked cloudy swelling with fatty changes. Spleen: Normal in size, soft and diffuent. Suprarenals and thyroid: Normal. Red marrow of sternum and ribs: No marked hyperplasia.

Bacteriology.—A bacillus with the morphology and cultural characters of the other organisms of the present series was obtained in pure culture from the spleen and heart-blood. In the first agglutination tests with this organism after isolation, the findings were:—

Against immune serum of Strain 4: ++ 1 in 5,000. + in 10,000.

Against Lister Institute para B serum (titre 6,000) *Nil* 1 in 50.

TABLE A.

No.	Initials	Clinical diagnosis of case	Duration of fever	Day of disease of positive blood culture	Isolation of organism from other sources	Probable place of infection	Character of infection
1	Pte. S. . .	Bronchitis (NYD enteric group)	11 days	9th day	..	Baghdad	A somewhat severe attack: the course suggesting an enteric infection
2	Lance Cpl. M'G.	Influenza with bronchitis	6 days	3rd day	..	Baghdad	A short but very acute fever
3	Pte. W.	"Clinical malaria," followed by lobar pneumonia	14 days	No culture made	Lungs, spleen, heart-blood	Kermanshah	Both very severe and fatal infections with all the signs of lobar pneumonia (see post-mortem notes
4	Sgt. G. . .	Bronchitis followed by lobar pneumonia	15 days	9th day	Lungs, spleen, bile	Baghdad	
5	Pte. H.	Bronchitis	7 days	4th day	..	Kifri	A mild infection
6	Pte. D.	Acute dysentery (bacillary?)	28 days (?)	No culture made	Spleen, heart-blood	Tekrit	A very severe toxic infection, with a hemorrhagic colitis ending fatally (see detailed notes on clinical history and autopsy)
7	Cpl. B.	Bronchitis (NYD enteric group)	11 days	9th day	..	Baghdad	N ^o t of special note. Clinically very suspicious of an enteric infection
8	Pte. G.	Bronchitis	5 days	4th day	..	Baghdad	Both mild, short fevers
9	Pte. D.	Bronchitis	7 days	4th day	..	Baghdad	

As for the cases in general, some of the clinical data have been tabulated in Table A, while a summary of the notes on the chief symptoms observed is given below. No special stress can be laid on any clinical feature which may not occur in the course of enteric group infections, although the prominence of respiratory symptoms has been somewhat striking in the present series of cases.

Course of the Fever.—The fever, which was in most instances of sudden onset, appears to be of variable duration depending partly on the relative severity of the infection, partly on the extent of involvement of the respiratory tract. The milder cases lasted five to seven days on the average. Two patients (Nos. 1 and 7) each ran an eleven days' fever, at first intermittent and latterly of the continued type (see Chart IV). Of the fatal cases, one of the pneumonias (No 4) ran a continued fever during the whole fifteen days' illness. The other (No. 3) showed a markedly intermittent course for ten days, becoming of the continued high type on the onset of extensive lung consolidation four days before death. The fatal "hæmorrhagic" case (No. 6) ran a twenty-eight days' pyrexia and was of the continued type during the fourteen days he was under observation.

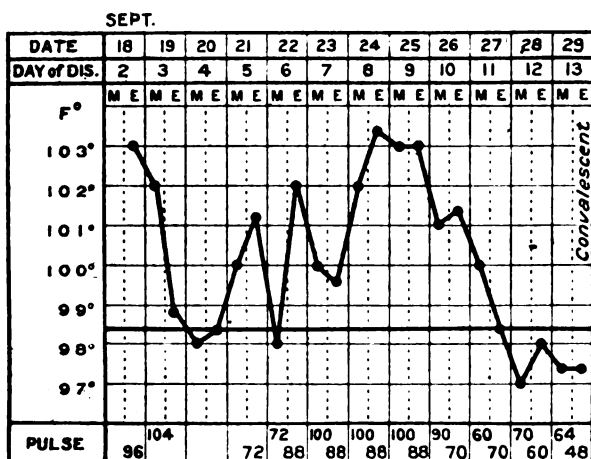


CHART IV.

As regards relapses, none occurred while the patients were convalescing in hospital, or subsequent to discharge, as far as could be learned from their after-history.

Respiratory System.—Marked involvement of the respiratory tract was a feature of all the cases except three. Thus in four instances in which this inagglutinable paratyphoid-like organism was obtained by blood culture, the infections were of a mild character and of short duration, while bronchial catarrh was so prominent a feature that all four cases had been labelled "bronchitis," or "influenza with bronchitis." As already

150 *An Infection due to the Gaertner-Paratyphoid Group*

described, two of the fatal infections appeared clinically to be suffering from lobar pneumonia, as was subsequently proved at autopsy (Cases 3 and 4). Of the three cases with no respiratory symptoms two of them had been considered enteric infections, while the third was regarded as a markedly toxic type of bacillary dysentery. Smears and cultures of throat swabs from a number of the patients gave nothing of pathogenic importance.

Alimentary System.—Gastric and intestinal symptoms were in most instances inconspicuous. Vomiting, except in Case No. 6, was absent, while constipation was the rule. Case 5, considered clinically an "enterica" infection, suffered from diarrhoea in the early period of the illness, while in the fatal "pneumonias" (Nos. 3 and 4) there was no lesion of the intestinal tract except that one showed a pink oedematous condition of the jejunum and upper part of the ileum. The Peyer's patches and solitary glands appeared quite normal. The third fatal case (No. 6), however, showed distinct intestinal lesions which have been described above. This patient had complained of marked hypogastric tenderness in the early days of his fever. Otherwise, abdominal distension or tenderness was not a feature of the cases.

Nervous System.—There was no nervous symptom of special note. Delirium was present towards the end in the two fatal cases of pneumonia, while No. 6 sank into the typhoid state before death.

Skin.—Nothing suggestive of rose spots or of an eruption of any kind was seen in any of the series.

Abdominal Organs.—Spleen: Its size varied considerably in the different cases. Some of the notes report the organ as being slightly or distinctly palpable on deep inspiration. In one fatal case it was two fingers-breadths below the costal margin, while at the other two autopsies the organ showed nothing of special note. Malarial parasites or pigment were not seen in any smears of the splenic pulp.

Liver, kidneys and bladder: Nothing of special note. The usual febrile albuminuria was present in the cases examined. The presence of pus cells or other cellular elements was not observed.

DISCUSSION.

The question as to whether this bacillus found associated with the present series of cases is an aberrant type of *B. paratyphosus* B, or whether it is an undescribed organism (which for convenience may be called *B. paratyphosus* C) belonging to the Gaertner-paratyphoid group, is a matter for discussion.

The fact that, after as many as thirty subculturings, none of the strains of the organisms are agglutinated by specific para B serum (Lister Institute) in any dilution at all approaching its maximum titre is important especially when it is remembered that the isolation of readily agglutinable para B bacilli during the course of routine blood culture work in Baghdad

has been far from uncommon. Consideration must also be taken of the unusual nature of such agglutination as was obtainable with high-titre para B serum, viz., the very fine soft flocculi which seldom produced much sedimentation and which never left a clear supernatant fluid. Nor do the serological observations, described above, point to the organism having closer affinities to the *B. aertrycke* group, although it has to be noted that unfortunately it has not yet been possible to obtain from Europe any of the recognized high-titre *B. aertrycke* sera.

Clinically, although it is well recognized that marked respiratory symptoms may be a common accompaniment of paratyphoid B infections and indeed have been the chief feature of certain enteric epidemics, yet the local microbic infection in these cases is still a matter of dispute. Bacilli of the Gaertner-paratyphoid group have been reported on various occasions as having been isolated from the sputa, but as to whether they were originally present or were merely secondary invaders does not appear to have been conclusively settled. It has not been possible to consult the literature on the subject, but Miller [1] in his recent Goulstonian Lectures (1917), on "Paratyphoid Infections," says, "the paratyphoid bacilli apparently do not attack the lungs and pleura themselves. Labbé, however, mentions a case of abscess of the lung from the pus of which *B. paratyphosus* was isolated. Apart from this rather special case, I cannot find a recorded instance of paratyphoid bacilli being found in the pleural fluid ante-mortem nor in the lungs post-mortem. I can only think that if these organisms do attack the lungs and pleura it must be but rarely." In the two cases of the present series which showed extensive pneumonic consolidation, the organism was isolated from the lung juice in pure culture on MacConkey's bile medium, while, except for a few scattered diplococci which did not resemble the pneumococcus, it alone was seen in stained lung smears.

The duration of the bacillæmia is so far undetermined, as positive blood cultures were obtained from the third to the ninth days inclusive in the various cases. Marked involvement of the intestinal tract, except where the infection assumed the character of a hæmorrhagic septicæmia, was uncommon, and the absence of any lesion of Peyer's patches or of the solitary glands may be of importance as a differential feature.

My attention has recently been drawn to an account by Neukirch [2] of an epidemic which occurred between March, 1915, and the early part of 1917 in Anatolia and Turkey, from the cases of which an organism called *B. Erzindjan* was isolated. This organism, the author concludes, is closely related culturally to *B. paratyphosus* B and the *suipestifer* group, but it can be differentiated by serological tests. From the title of his paper Neukirch is inclined to identify the organism with the Glässer-Voldagsen group, placing his reliance on the agglutination tests. Yet he states that all the strains of *B. Erzindjan*—like those isolated from the present series of cases—produced acid at first in litmus milk, followed later by alkali

production, except one which showed no initial acidity. On the other hand, all the Glässer-Voldagsen strains tested produced acidity and remained acid until the end of the ten days recorded. It seems difficult to accept the serological similarity and ignore this constant biochemical difference between the organism under review and the Glässer-Voldagsen group. The cultural characters of *B. Erzindjan* cannot be compared with our *B. paratyphosus* C, as Neukirch has, so far, described its action on glucose and lactose only.

This worker distinguishes two main clinical groups of cases from which the *B. Erzindjan* was obtained in pure culture:—

- (1) The "typho-septic" type with a mortality of forty-six per cent.
- (2) The dysenteric type with a much smaller mortality of 6·7 per cent.

For comparison he quotes a five per cent mortality rate as having occurred among the infections of the "enterica" group. Two other groups are also mentioned, viz., four cases of slight general infection and a solitary case of pyelonephritis. Neukirch draws special attention to the very variable clinical picture met with, and to the difficulties of distinguishing these cases from those of typhoid, paratyphoid and dysentery apart from a bacteriological diagnosis. I have not had access to the original article to ascertain what types of infection are included in the group called "typho-septic," but it appears very probable that the causative organism in the present series of cases of infection among British troops is the same as that described as *B. Erzindjan*.

Most of the cases which are the subject of this paper appear to have been infected in the Baghdad area, although in three instances the evidence available pointed to the place of infection being much farther up the line, viz., at such widely separated places as Kermanshah, Tekrit, and Kifri. For the present it is impossible to say anything about the epidemiology. The probable prevalence of the infection among the native population requires investigation, while it would be of considerable interest to learn whether a similar para C-like organism has been among the bacteriological findings in Palestine and in other areas of military operations in the Near East.

SUMMARY.

(1) A series of inagglutinable organisms culturally and morphologically indistinguishable from *B. paratyphosus* B, have been isolated by blood culture in Baghdad during the latter half of 1918, and it is learned that similar findings have been reported in other areas of Mesopotamia.

(2) Of the three patients suffering from the infection, who died, two of them were clinically regarded as cases of lobar pneumonia. At autopsy the same cocco-bacillus was isolated from the lungs and spleen, and in one instance from the gall bladder also. Respiratory symptoms were a prominent feature of most of the cases, while the symptomatology and course of the fever were usually not suggestive of an enteric group infection.

(3) Serologically, all the strains on isolation were inagglutinable to the "enterica" high-titre sera (Lister Institute). After thirty subculturings of the organism, agglutination of an atypical character was present in dilutions up to 1 in 1,000 of specific para B serum (Lister); while, in comparison, a 1 in 10,000 dilution of the same serum led to marked clumping with two stock strains of *B. paratyphosus* B. Absorption tests tended to confirm these serological differences. The sera obtained from three rabbits immunized with different strains of the bacillus readily agglutinated the whole series of organisms in dilutions of 1 in 5,000 to 1 in 10,000; whereas no reaction resulted with the stock *B. paratyphosus* B in dilutions higher than 1 in 250. Equivocal findings were also recorded in tests with a strain of presumed *B. aertrycke*.

(4) The real identity of the organism is, so far, undecided. In its behaviour with specific sera it is distinguishable from both *B. paratyphosus* B and *B. aertrycke*, although closely related to both. It has been learned with interest that an epidemic in Turkey and Anatolia has been described as due to a paratyphoid-like organism with similarly atypical serological characters. If the bacillus should eventually be proved not to be a specific organism, but to be simply a variety of *B. paratyphosus* B, the practical importance of its recognition seems to lie in the fact that the recognized high-titre para B sera fail altogether to agglutinate it on isolation, and after numerous subculturings they react with it to only a limited extent, while a special immune serum is necessary for its ready identification. Many of the organisms which have been from time to time reported as non-agglutinable or "temporarily inagglutinable" para B bacilli may belong to this para C-like group.

It is with pleasure that I acknowledge my indebtedness to Lieutenant-Colonel J. C. G. Ledingham, C.M.G., R.A.M.C., Consultant Bacteriologist to the Mesopotamian Expeditionary Force, for his great assistance and helpful criticism; while I desire to express my thanks to Lieutenant-Colonel H. J. Crossley, R.A.M.C., officer commanding — Stationary Hospital, Baghdad, for access to and the use of the clinical records of the described cases.

REFERENCES.

- [1] MILLER, 1917. *Lancet*, vol. i, p. 831.
- [2] NEUKIRCH, 1918. *Ztschr. f. Hyg. u. Infektion-krankh.*, vol. lxxxv, p. 103.

NOTE ON THE CHARACTERS OF AN ANOMALOUS MEMBER OF THE PARATYPHOID GROUP MET WITH IN MESOPOTAMIA.

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INTRODUCTORY.

IN the course of our work in Mesopotamia we have from time to time isolated from the blood of suspected entericas, organisms conforming biochemically to *Bacillus paratyphosus* B but failing to respond to paratyphoid B serum (Lister Institute) in dilutions which would justify a positive diagnosis of that organism.

The biochemical property chiefly relied upon in linking these anomalous types with *B. paratyphosus* B has been the relatively abundant production of gas in media containing glucose, mannite and dulcite, and when this property has been associated with feeble agglutinability in 1 in 100 or 1 in 200 dilutions of para B serum, it has been customary to return a provisional diagnosis of "inagglutinable para B."

High titre sera for other members of the Gaertner-paratyphoid group have invariably failed to agglutinate these organisms even in the lowest dilutions. Fortunately many of these anomalous strains have been preserved, and the apparent acquisition by a certain proportion of them (but by no means all) of a definite though peculiar response to para B serum in relatively high dilutions after repeated subculture in broth, has merely delayed the investigation which it is the object of this paper to describe, and which in our opinion demonstrates the presence of a "new" paratyphoid organism, sharply defined serologically though possessing undoubted affinities with *B. paratyphosus* B and possibly with *B. suipestifer*.

During the latter part of 1918 a series of such strains were recovered from the blood, and it will be well at this stage to set forth briefly the clinical history and physical signs of some of these cases before proceeding with the bacteriological investigation. A paper dealing with the same subject has, we understand, been submitted for publication by Captain MacAdam, R.A.M.C., of 31 B. S. Hospital, Baghdad, whose conclusions agree in the main with ours.

Table I summarizes the main points concerning the duration of disease, inoculation history, response of the organism to high titre sera at primary isolation, in a recent series of twelve cases (five British and seven Indian) which occurred in the last quarter of 1918.

TABLE I.—SUMMARY OF RECENT CASES.

Laboratory number	British or Indian	Organism isolated of disease	Inoculation history, T.A.B.	Clinical details and place of origin	Organism; how obtained	Biochemical reaction	High titre sera	
							Para B	Para A and Gaertner
707	Indian	7	February, 1916	N.E. area of operations, including Persian L. of C.; no clinical details known; recovered?	Blood culture		—	Strain lost
709	British	14	March, 1918	N.E. area; severe septic type with kidney signs and superficial abscesses; recovered	"		—	Strain lost
782	Indian	6	Not inoculated	N.E. area; mild case; seven days fever with diarrhoea; recovered	"		—	—
815	Indian	8	December, 1916	Baghdad area; fifteen days irregular fever with congestion of the lungs; recovered	"		—	—
825	Indian	7	March, 1918	N.E. area; influenza-like type	"		—	—
967	Indian	6	No record	N.E. area; high intermittent fever; pulmonary involvement; death	"		Trace 1 in 200	—
1,059	Indian	20	March, 1918	Baghdad area; broncho-pneumonia and irregular fever	"		—	—
1,165	British	5	August, 1915	Irregular fever; organism isolated from blood and later from gluteal abscess; septic type	Blood culture and abscess		—	—
1,250	British	8	January, 1918	N.E. area; fever ten days duration with cerebral symptoms	Blood culture		1 in 800	—
1,251	British	17	July, 1918	N. area—Baghdad-Mosul line; fever ten days duration; bronchitis; influenza-like	"		—	—
1,332	British	Third week	—	N.E. area; temperature and general symptoms those of a paratyphoid fever; blood culture on ninth and thirteenth days sterile; organism recovered from urine	Urine		1 in 400	—
S. B. 72	Indian	25 days	—	Signs of liver disease and jaundice; fever only the last seven days before death; post mortem showed multiple necrotic areas in the liver	Liver, post mortem		—	—
*1,298	British	10	November, 1917	N.E. area; a case of <i>Paratyphoid B</i> for comparison; clinically typical of paratyphoid; no lung complication	Faeces		1 in 3,200	—

* B case included for comparison.

Of late we have taken the opportunity of visiting some of these cases with the object of ascertaining whether the organism in question was associated with any peculiarity of clinical syndrome, and we, therefore, make no apology for submitting fuller clinical notes of eight cases (five British and three Indian).

Case 967 (Indian).—His condition at the onset is not known accurately, but the disease started with fever and frequent diarrhoea accompanied by griping pains. No enlargement of the spleen or liver. Bronchitis was an early symptom, being especially marked at the bases of the lungs. About the ninth day of the disease the lung condition was more pronounced, and the bases are now described as being congested and probably pneumonic, and the patient was semi-conscious. The pulse became weak, the tongue dry and furred, he passed motions and urine in bed. At this stage a blood culture was sent and a para B-like organism recovered in pure culture. The spleen was not enlarged at any stage, nor were spots found. The temperature maintained an irregular course up to the fifty-first day of the disease, when he was evacuated to the base and lost sight of. His general condition improved considerably, though he was very debilitated when transferred.

Case 1,059.—An Indian who contracted the disease in Baghdad. He gave a history of fever for ten days before admission. On admission he was found to have high fever, and an intermittent fever which suggested malaria. No parasites were found in the blood. His pulse and respirations were high, and signs of partial consolidation were found at the base of the right lung. Jaundice supervened. Quinine by the mouth and intramuscularly was ineffective, and he died on the twentieth day of the disease. On the day of his death a blood culture was taken, and the organism to be described was found in pure culture.

Case 709.—A British soldier, taken ill at Sharaban on August 28, 1918. Temperature 101.4° F., headache and sore throat. Transferred to Baghdad August 31, 1918, as N.Y.D. fever, temperature 103° F., tongue dry and furred, throat congested, liver slightly enlarged, spleen much enlarged, diarrhoea. No malarial parasites found in the blood, no Klebs-Loeffler bacilli found in the throat. Examination of the fæces showed amœbæ of uncertain nature, so he was put on emetine and quinine. General condition very weak and wasted. Septic sores on forehead, back and arms. Blood culture on the fourteenth day of the disease yielded a pure growth of the para B-like organism. He was in a very septic condition, and all hypodermic punctures suppurated. On the twenty-eighth day of the disease a petechial rash was noted on both forearms. He was delirious at intervals. Albumin and pus cells were present in the urine. Septic sores continued to break out and fresh pustules appeared. The albumin and pus in the urine increased. He was later put on urotropine. The abdomen became distended and patient developed a cough, and a sudden rise of temperature which soon subsided. His condition began to improve, though his temperature remained irregular till the fortieth day of the disease, after which it fell, and he made an uninterrupted recovery.

Case 1,165.—This patient showed a long-continued irregular fever, which was

only like enteric group disease in the first week or ten days. Blood culture on the fifth day gave a pure culture of an inagglutinable para B-like organism. Fecal examination on the thirteenth, fourteenth, fifteenth and twenty-sixth days

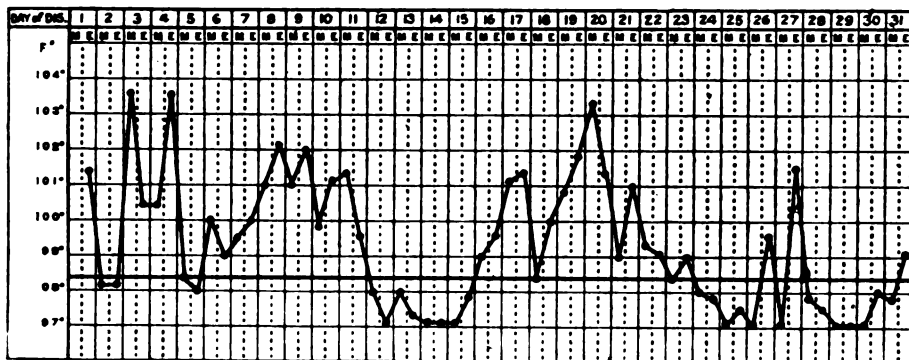


CHART I (Case 709).

were negative, but about the thirty-sixth day his temperature rose, and he was found to have an abscess in the buttock. Pus from this grew the same organism as that which had been isolated from the blood. A vaccine was made, and after two doses his temperature came down to normal.

This case is of interest in showing a pyæmic deposit of the organism under discussion.

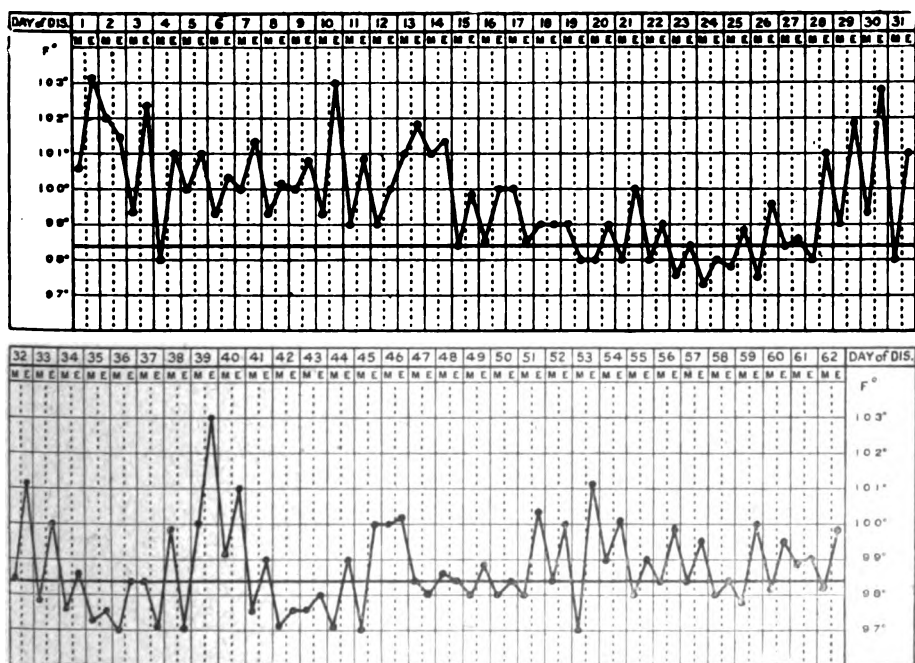


CHART II (Case 1,165).

Case 1,250.—This case showed a short sharp fever of nine days' duration, followed by recovery. He was very drowsy and almost comatose at the height of the attack, so that he was suspected to be suffering from cerebral malaria. Spleen enlarged, no lung signs, no spots, no abdominal signs, but liver enlarged. Blood culture was positive on the eighth day.

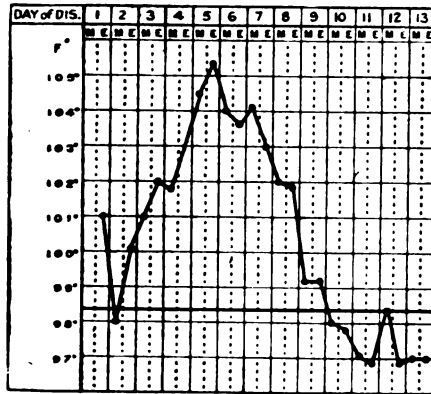


CHART III (Case 1,250).

Case 1,251.—This patient was taken ill on the march to Mosul at the end of operations. The first and chief symptom was bronchitis. Influenza was at first suspected, and then malaria, so he was given oral and intramuscular quinine. No parasites were, however, found in the blood. The spleen was enlarged, but no other abdominal signs. The fever lasted for ten days, and was very similar to the last case, though not quite so severe. A blood culture taken on the sixth day of the rise (or the seventeenth day from the onset of the illness) gave a pure culture of an inagglutinable para B-like organism.

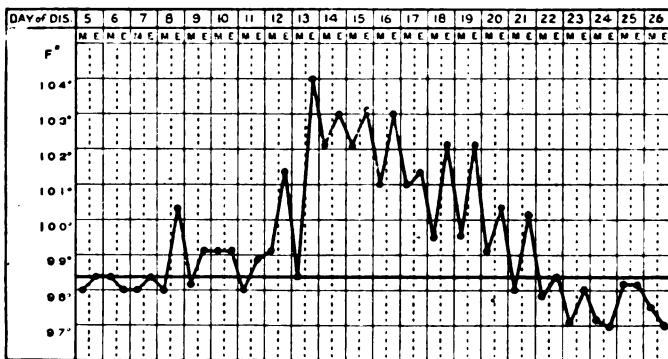


CHART IV (Case 1,251).

Case 1,332.—A British soldier, working in the refugee camp at Baquba. He was ill four or five days before going to hospital. His chart shows an irregular fever, like that met with in paratyphoid fever. Slight bronchitis, abdomen dis-

tended, spots not present. Trace of albumin in the urine. Spleen and liver not felt. Has the appearance of a mild enteric. He suffered from nephritis when in France.

Blood cultures taken on the ninth and thirteenth days proved sterile. Para B inagglutinable was recovered from the urine on the twenty-fourth day of the disease.

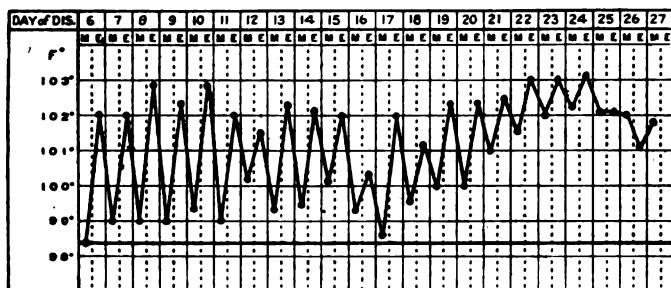


CHART V (Case 1,332).

Case 72.—This case is remarkable because his symptoms, till the last week, were almost entirely hepatic.

He reported sick on November 4, 1918, complaining of pain in the upper abdomen and vomiting after food. The tongue was foul and the bowels constipated. Liver enlarged three fingers below the costal margin and tender. This continued, and later jaundice supervened. *Entamoeba histolytica* cysts were found in the stool, and he was noted to be very anæmic. On November 18 his liver was explored, on the supposition of abscess, but no pus was found. On November 23 he developed fever, which continued till he died on November 29. His liver symptoms increased, and hæmatemesis and melæna preceded death.

Post-mortem examination showed the presence of free fluid in the peritoneum, great enlargement of the liver, which was dotted with yellowish areas and nodules like new growths, and multiple abscesses. No primary growth was found. Some signs of old dysentery but no ulceration in the small gut. Spleen was enlarged. Portions of the liver were sent to us by Captain Pasley, R.A.M.C. (to whom we are indebted for these notes), and the bacillus referred to was isolated from the necrotic areas present in the liver.

Sections of the liver showed that the nodules referred to were necrotic in character, characterized by central areas of complete cell destruction with surrounding intense infiltration of small cells, that is, they were in effect multiple abscesses. These areas contained numerous Gram-negative coliform bacilli.

REMARKS ON THE CLINICAL NOTES, ETC.

This side of the investigation is not as complete as we should wish, but the situation and the relation of the Central Laboratory do not offer such facilities for the close observation of cases as the pathologists of hospitals enjoy. The earlier cases had all been sent down the line before

the laboratory investigations were sufficiently advanced to suggest special attention being paid to their clinical state. Latterly all cases have been seen, and we are indebted to various medical officers for providing notes and charts and for giving us access to the cases.

It will be seen that the majority of the cases came from or near the railhead of the Persian lines of communication, and especially from the Jelus refugees or those who have been brought into contact with them. This is of interest in view of recent reports (reviewed in the *Tropical Diseases Bulletin*) of investigators working in Armenia and the Caucasus who have described anomalous organisms of the same kind, and which were considered by them to have affinities with *B. suipestifer* or *B. aertrycke* (*B. Erzindjian*).

Several patients, however, have apparently contracted the disease in Baghdad; one apparently was infected on the Baghdad-Mosul line, and one culture was recently sent to the laboratory from Nasariyeh on the South Euphrates. Samples of high titre "C" serum have been sent out from the laboratory to all first-class laboratories in Mesopotamia, and further evidence of the occurrence of this strain will probably be available later.

Of the 11 cases of which we have some clinical details, 6 were inoculated with T.A.B. vaccine within a year, 2 longer than a year, and in 3 there was no record; 5 were British and 6 were Indian.

The organism was recovered from blood cultures in a pure state in 10 and from the urine in 1 case (21st day).

The days on which blood cultures were positive were as follows: 5, 6, 6, 7, 7, 8, 8, 14, 17, 20.

SUMMARY OF CLINICAL SYMPTOMS.

As regards the clinical symptoms it is evident that in general they are suggestive of the enteric group of diseases, as blood cultures have been sent on that supposition. In the charts which are available it appears that the course of the fever is variable.

In two cases there were clear-cut attacks of fever lasting about ten days, whilst in others the fever was of a long continued remittent nature which had some of the characters, but was by no means typical of, the other varieties of paratyphoid fever. In several cases there were well marked pulmonary symptoms, varying from bronchitis to congestion of the bases, and in one case to consolidation of the lung, so that a diagnosis of pneumonia was arrived at.¹

The Case 72 is remarkable in that well defined necrotic areas were found in the liver, and it was from these that the bacillus was isolated. Case 1,165 gave a positive blood culture, and later the organism was

¹ Captain MacAdam's cases bring out this point still more strongly.

isolated from an abscess in the buttock. Though we have not studied the clinical side sufficiently to point out any distinction between infection from this organism and the paratyphoids A and B, it seems as if "Para C" had a particular liability to produce visceral infections especially in the lungs. The slowing of the pulse, so marked a feature in the paratyphoid fevers, seems to be less evident in these cases. The other strains referred to in this paper are devoid of any detailed clinical history.

782, 707, 20, 41, and 44 are all strains from Baquba (near the rail-head for the Persian Lines of Communications). The last three of these were isolated by one of us (G. J. B.), during an investigation into an epidemic of malaria and dysentery amongst the Jelus refugees, who came from the neighbourhood of Lake Van.

The remaining strains—viz., 5,297, 4,443, 7,776, 8,021, 4,364, 3,414, were all "para B inagglutinables," which have been met with from time to time in Amara and Baghdad (1917-18), and had been set aside for further examination.

DESCRIPTION OF THE ORGANISM.

A motile Gram-negative coliform organism, growing freely on agar, and on MacConkey plates as a semitransparent, lactose non-fermenter, of medium size. No odour is produced by the growth on agar. The sugar reactions in such sugars as are at our disposal are identical with those of para B.

Lactose ..	..	..	No change	
Glucose ..	..	..	A. G.	<i>Litmus Milk.</i>
Mannite ..	..	..	A. G.	
Dulcitol ..	..	..	A. G.	Acid for one or two days.
Maltose ..	..	..	A. G.	Turns alkaline from third to
Saccharose ..	..	..	No change	seventh day.
Indol ..	..	..	—

The reactions of all the organisms which are the subject of this paper are identical in the above characters, and remain constant after repeated subculture. This organism will be referred to hereafter as para C for purposes of convenience.

SERUM REACTIONS OF DIFFERENT STRAINS IMMEDIATELY AFTER ISOLATION FROM THE PATIENTS.

On account of its biochemical relations to the Gaertner (para B group) it was generally put up with Gaertner high titre sera, but as the results show, it was never agglutinated by this serum.

It was evident from these reactions that we had to deal with an anomalous organism, and at first we thought the agglutinating power would be recovered by repeated subcultures.

Strains	Sera			Gaertner
	T 200	A 200	B 200	
707	—	—	—	—
709	—	—	—	—
815	—	—	—	..
825	—	—	—	..
967	—	—	+	—
1,059	—	—	—	—
1,165	—	—	—	.. (from blood)
1,165	—	—	—	.. (from abscess)
782	—	—	—	—
1,350	—	—	+	..
1,351	—	—	—	..
1,332	—	—	+	..

Five strains were accordingly passaged thirty times from broth to broth over a period of about three weeks. They were then tested in several dilutions of stock high titre paratyphoid B serum (Lister Institute, of November 28), with the following results:—

Strain of bacillus	100	200	400	800	1,600	3,200	6,400	12,800
815	—	—	—	—	—	—	—	—
825	—	—	—	—	—	—	—	—
967	++	++	++	+	+	+	—	—
1,059	+	—	—	—	—	—	—	—
31 B.S.H.*	—	—	—	—	—	—	—	—
Stock para B (Royal Army Medical College)	++++	++++	++++	+++	+++	++	—	—

* A strain obtained from Captain MacAdam, R.A.M.C.

The result showed that the lack of agglutinating power was not an accidental feature, in that it could not be recovered by repeated subculture.

THE PRODUCTION OF A HIGH-TITRE SERUM TO PARA C.

The first two experiments failed, in that both rabbits died in from three to four days of a virulent septicæmia, caused by the bacillus with which they were inoculated. The vaccine had been heated to 56° C. for twenty minutes, but the bacteria were evidently not killed by this treatment.

For the next experiment the vaccines were heated to 60° C. for forty minutes. Rabbits 782 and 1,059 were given intravenous injection of killed culture beginning at one-tenth of a loopful, and ending with one loopful of living culture. One rabbit (1,059) died in four days after the living dose, and its serum withdrawn post mortem and that of the living rabbit were then tested. The signs in the rabbit which died were those of a toxic septicæmia. The peritoneum and pleuræ were dotted with small hæmorrhages, and bloody serous effusions were found in these sacs. Rabbit 1,059 showed purple hæmorrhagic inflammation of the appendix. Annexed are shown the interactions of these two sera and strains.

Serum from rabbit inoculated with		Strain	59	100	Dilutions of high-titre serum *				1,600	3,200	6,400
Strain					200	400	800				
782 v.	782		++++	++++	++++	++++	++++	++++	++++	++	+
782 v.	1,059		++++	++++	++++	++++	++++	++++	++++	++	+
1,059 v.	1,059		++++	++++	++++	++++	++++	++++	++++	++	+
1,059 v.	782		++++	++++	++++	++++	++++	++++	++++	++	+

* +++++ = Strong agglutination with sedimentation and complete clearing of supernatant fluid.

+++ = The same reactions not complete in every particular.

++ = Partial agglutination with some opalescence of supernatant fluid.

+ = Distinct but incomplete agglutination.

- = No reaction.

Controls were always done and, unless otherwise stated, were negative.

Rabbit 782 was then bled out and its serum used as a "High-titre C serum" (titre about 3,200). This C serum was then tested against all the available strains of those hitherto called "para B inagglutinable." The results are shown in Table II.

TABLE II.—PURE PARA "C" STRAINS (TYPE "M").

Strain	High-titre sera	Dilutions 1 in							
		100	200	400	800	1,600	3,200	6,400	12,800
815	"C"	++++	++++	++++	++++	++++	+++	++	+
	"B"	—	—	—	—	—	—	—	—
825	"C"	++++	++++	++++	++++	++++	+++	++	+
	"B"	—	—	—	—	—	—	—	—
1,059	"C"	++++	++++	++++	++++	+++	++	+	—
	"B"	Trace	—	—	—	—	—	—	—
1,251	"C"	++++	++++	++++	++++	++++	++++	++	++
	"B"	—	—	—	—	—	—	—	—
Jelus 20	"C"	++++	++++	++++	++++	++++	+	Trace	—
	"B"	—	—	—	—	—	—	—	—
31	"C"	++++	++++	++++	++++	+++	+	Trace	—
	"B"	—	—	—	—	—	—	—	—
B.S.H. 4,443	"C"	++++	++++	++++	++++	+++	+++	+	—
	"B"	—	—	—	—	—	—	—	—
7,776	"C"	++++	++++	++++	+++	++	Trace	—	—
	"B"	—	—	—	—	—	—	—	—
8,021	"C"	++++	++++	++++	++	+	Trace	—	—
	"B"	—	—	—	—	—	—	—	—
3,414	"C"	++++	++++	++++	++++	++++	+++	++	—
	"B"	—	—	—	—	—	—	—	—
72	"C"	++++	++++	++++	—	—	—	—	—
	"B"	—	—	—	—	—	—	—	—

* Paratyphoid B serum from Lister Institute.

TABLE II (continued).—PARA "C" STRAINS WHICH REACTED ALSO TO A CO-AGGLUTININ IN PARA "B" HIGH-TITRE SERA (TYPE "N").

Strain	High-titre sera	Dilutions 1 in							
		100	200	400	800	1,600	3,200	6,400	12,800
782	"C"	++++	++++	++++	++++	++++	++	+	—
	"B"	++	+	+	+	—	—	—	—
967	"C"	++++	++++	++++	++++	++++	++++	++	+
	"B"	++	++	++	+	+	+	—	—
1,250	"C"	++++	++++	++++	++++	++++	+++	++	Trace
	"B"	—	+	+	+	+	—	—	—
Jelus 41	"C"	++++	++++	++++	++++	++++	++++	+++	+
	"B"	+	+	+	+	+	+	+	—
Jelus 44	"C"	++++	++++	++++	++++	+++	+++	++	+
	"B"	++++	+++	++	++	++	+	—	—
5,237	"C"	++++	++++	+++	+++	++	++	—	—
	"B"	—	++	+	+	+	—	—	—
4,364	"C"	++++	++++	++++	+++	+++	+++	+	—
	"B"	—	+	+	+	—	—	—	—
1,332	"C"	++++	++++	++++	++++	+++	++	Trace	—
	"B"	+	+	++	Trace	—	—	—	—

THE AGGLUTINATION REACTIONS OF PATIENTS' SERA TO VARIOUS STRAINS OF PARA "C" BACILLI.

Experiment I.—Serum of Case 1,250. (Inoculated with T.A.B. vaccine nine months previously.)

V.	1/25	1/50	1/125	1/250	1/500
Bacillus 1,250 ..	++++	++	±	—	—
Para "C" (782) ..	++++	+++	+	—	—
Stock Para B ..	++	+	—	—	—

Experiment II.—Serum of Case 1,251. (Inoculated with T.A.B. vaccine about four months previously.)

V.	1/25	1/50	1/125	1/250	1/500
Strain 1,251 ..	++++	++	+	—	—
Para "C" (782) ..	++++	++++	++	+	±
Stock para B ..	++	++	+	+	—

Experiment III.—Serum of Case 1,332. (In this case the bacillus was cultivated from the urine in the third week of the disease. There was no history of antityphoid inoculation.)

V.	1/25	1/50	1/125	1/250	1/500
Strain 1,332 ..	++++	++++	++++	++++	++++
Para "C" (782) ..	—	—	—	—	—
Para B ..	+++	+++	+	+	+

Floc. soft
and
dispersable

Experiment IV.—Serum of Case 1,165. (In this case the bacillus had been isolated first by blood culture and later from a subcutaneous abscess. The patient had had two doses of autogenous vaccine. He had received typhoid vaccine three and a half years previously.)

V.	1/25	1/50	1/125	1/250	1/500
Strain 1,165 ..	++++	++++	++++	+++	+
Para "C" ..	++++	++++	++++	+++	++
Para B ..	—	—	—	—	—

Experiment V.—A control experiment with the serum of a patient (No. 1,298) from whom a true para B had been isolated from the stools.

V.	1/25	1/50	1/125	1/250	1/500
Strain 1,298 ..	++++	+++	++	++	—
Para "C" ..	—	—	—	—	—
Para B ..	++++	++++	++++	++++	++++

Experiment VI.—The serum of one of the patients (No. 1,251) put up against a number of different "C" strains isolated from other patients.

V. "C" strains etc.			Blood serum of Case 1,254.			
			1/25	1/50	1/125	1/250*
782	+++	+++	+	+
1,251	++++	++++	++++	++++
3,414	++++	++++	**	++++
7,776	++++	++++	++++	++++
Jelus 20	++++	++++	++++	++++
31	++++	++++	++++	++++
G.-pig Aerttrycke			++	+	—	—
Para B (No. 7,115)			+++	++	++	+

* Not carried further.

** Accident.

Remarks.—It is evident from the above results that the blood of patients suffering from "para C" infection shows well-marked agglutinating properties when tested against the homologous organism and also against other "para C" strains. The power of agglutinating para B was in every case much less marked; this may have been due to the presence of a co-agglutinin or in some cases more probably to the effect of recent T.A.B. inoculation.

ABSORPTION EXPERIMENTS.

From the foregoing data in Table II it will be apparent that of the strains grouped under the "para C" category, eleven are agglutinated in very high dilution by "C" serum alone and not at all influenced by para B serum; whilst eight strains are influenced by both sera.

In the latter, however, the reactions with "C" serum exhibit a degree and type of agglutination which of themselves would suggest a very much closer serological affinity to the "C" group than to para B. An attempt was, therefore, made to determine whether representatives of the two types, Type "M" (agglutinated by "C" serum only) and Type "N" (agglutinated by "C" serum and B serum, though in different degrees and of different type, as explained above) could remove the specific B agglutinins from a B serum.

The strains used were No. 31 and No. 44.

Experiment I.—Absorption of B serum by "C" strain No. 31 (M. type).

		Before Absorption.						
Dilution 1 in:		100	200	400	800	1,600	3,200	6,400
B serum v. B Bacillus ...		++++	++++	++++	+++	+++	++	—
„ v. Strain 31 ...		—	—	—	—	—	—	—
After Absorption with Strain 31.								
Supernatant v. B ...		++++	++++	++++	++++	++++	+++	—
„ v. 31 ...		—	—	—	—	—	—	—

Remarks.—As might be expected, no removal of B agglutinins occurred after absorption with strain No. 31, which is uninfluenced by B serum.

Experiment II.—Absorption of B serum with "C" strain No. 44 (Jelus ("N" type)).

		<i>Before Absorption.</i>							
		Dilution 1 in :	100	200	400	800	1,600	3,200	6,400
B serum v. B bacillus	..	++++	++++	++++	++++	+++	+++	++	—
„ v. Strain 44	..	+++	+++	+++	++	++	+	—	
<i>After Absorption with Strain 44.</i>									
Supernatant v. B	..	++++	++++	++++	++++	++++	++++	+++	—
„ v. 44	..	++	+	—	—	—	—	—	—

Remarks.—Absorption of B serum with No. 44 has not effected the removal of specific B agglutinins but has simply removed the co-agglutinin in B serum for strain No. 44.

Experiment III.—A control absorption experiment. B serum absorbed with a B strain, No. 7,115.

		Before Absorption.						
Dilution 1 in :		100	200	400	800	1,600	3,200	6,400
B serum v. B bacillus ..		++++	++++	++++	+++	+++	++	—
„ v. Strain 7,115		++++	++++	++++	++++	+++	+++	—
After Absorption with No. 7,115.								
Supernatant v. B ..		+++	+	—	—	—	—	—
„ v. 7,115 ..		++	+	—	—	—	—	—

Remarks.—Shows nearly complete removal of specific B agglutinins by absorption with No. 7,115 (a recently isolated B strain).

It has not been possible to multiply experiments of this kind owing to technical difficulties and accumulation of other work, but it is hoped that opportunity may be afforded at the Lister Institute, London, for a more complete study of the strains from the absorption point of view. The question whether these “C” strains may be allied to *B. aertrycke* has been borne in mind but owing to the lack of a classical strain of *B. aertrycke* and an anti-aertrycke serum this matter has only been partially undertaken in Baghdad.

Whilst the above work was in progress an epidemic of gastro-enteritis, accompanied by very high mortality, occurred amongst young calves at the Military Dairy Farm, Amara. This outbreak was investigated by Captain Laurence, R.A.V.C., the veterinary bacteriologist, who recovered from the blood of some of the calves strains which he, in conjunction with officers of the Central Laboratory, Baghdad, was able to demonstrate as belonging to the Gaertner-paratyphoid group. This investigation will be duly reported upon by the officers concerned. These calf strains are agglutinated well by B serum and also to some extent by “C” serum and not at all by B Gaertner serum, and in all probability they will be found to be genuine *B. aertrycke*.

At the same time an epizootic occurred also among the guinea-pigs at the Central Laboratory, Amara. Strains of a similar organism were isolated by Major T. H. Gloster, I.M.S., and these like the calf strains have been used as presumed *B. aertrycke* strains in the experiments which follow :—

Experiment IV.—Absorption of “C” serum with calf strain No. 4.

		Before Absorption.						
Dilution 1 in :		100	200	400	800	1,600	3,200	6,400
“C” serum v. Calf No. 4		+++	+++	+++	+++	+++	++	Trace
„ „ v. B ..		+++	++	++	+	+	+	—
After Absorption with Calf No. 4.								
Supernatant v. No. 4 ..		—	—	—	—	—	—	—
„ v. “C” ..		++++	++++	+++	+++	+++	—	—
„ v. B ..		—	—	—	—	—	—	—

Experiment V.—Absorption of “C” serum with calf strain No. 6.

		Before Absorption.						
Dilution 1 in :		200	400	800	1,600	3,200	6,400	12,800 25,600
“C” serum v. Calf No. 6		+++	+++	+++	+++	+++	+++	+++
B serum v. Calf 6 ..		++++	++++	++++	++++	++++	+++	+++

After Absorption of "C" serum with No. 6.								
Supernatant v. No. 6	—	—	—	—	—	—	—	—
" v. "C"	++++	++++	++	+	+	+	+	—
" v. B ..	—	—	—	—	—	—	—	—

Remarks.—The above two experiments show that the specific "C" agglutinins are not affected by absorption with either of the calf strains. The absorption simply removes the co-agglutinins in "C" serum for the calf strains and for para B.

A further series of experiments (not here detailed) in which "C" serum was absorbed with the presumed *B. aertrycke* (*B. suipestifer*) isolated from the guinea-pig epizootic yielded a similar result—viz., no removal of the specific "C" agglutinin but only that of the co-agglutinin in "C" serum for the guinea-pig strains, the calf strains and *B. paratyphosus* B.

It is hoped that opportunities will be afforded for multiplying and repeating experiments of this nature, but at present it would appear fairly clear that the "C" strains can be serologically differentiated both from true para B and from the presumed *aertrycke* strains recovered from the calf and guinea-pig epidemics.

We wish to acknowledge the help and guidance which has been given us in this investigation by Lieutenant-Colonel J. C. G. Ledingham, C.M.G., R.A.M.C. He has also kindly agreed to take some of the strains back to London and test them against classical strains of *B. suipestifer*. We also wish to acknowledge the help of Serjt. Trasler, Royal Army Medical Corps, and Pte. Bull, Royal Army Medical Corps.

ADDENDUM.

Whilst this paper was awaiting publication a communication has appeared in the *Lancet*, of February 22, 1919, p. 396, by Dr. L. Hirschfeld, entitled "A New Germ of Paratyphoid." From his description it appears that Dr. Hirschfeld has met with an organism similar to, if not identical with that described by us in this paper. He has met with the organism we describe at intervals during the years 1916, 1917 and 1918, and the paper describing it was read before the Inter-Allied Medical Society in Salonika on December 10, 1918.

The organism we describe has been met with from time to time during 1917 and 1918, but it was only in September 1918 that we began to carry out the experiments which led us to the conclusion that we were dealing with a specific entity.

NOTE BY J. C. G. LEDINGHAM, LISTER INSTITUTE.

The "C" strains above described have been retested in this Institute with results entirely confirmatory of those detailed by Mackie and Bowen. Further, the Hirschfeld strain obtained through the kindness of Colonel Harvey, Army Medical Service, of the Royal Army Medical College, behaves exactly like the Mesopotamian "C" strains and is agglutinated to titre by the Baghdad "C" serum. The strains isolated from the calf and guinea-pig epizootics at Baghdad and Amara prove to be types of *B. suipestifer*.

MEMORANDUM ON THE BACTERIA OF THE PROTEUS GROUP.

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AND

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WHILE carrying out the routine bacteriological examination of stools and urine in the laboratory of Queen Alexandra Military Hospital, we have occasionally found it necessary to consider possible variations in the characters of *Bacillus proteus* in order to make certain of excluding this organism in the search for pathogenic species. Since but scanty reference is made to the bacilli of the Proteus group in standard text-books, we have been obliged to consult original literature on the subject, and the present article practically constitutes a summing-up of the facts which, we think, may be taken as fairly representing present-day knowledge of the more important features of the group.

We feel justified in publishing the results of our inquiry by the fact that we had considerable difficulty in obtaining a clear view as to the constitution of the group, since many of the bacteria which are often even now described in text-books as distinct "species" are, on investigation, found to present insufficiently distinctive characters to entitle them to recognition as such. Our object, therefore, is to enable others to dispense with the need for making similar inquiries, by distinguishing between matter which is of historical interest only and facts which may be regarded as reasonably well established. We propose, firstly, to consider briefly the origin of the Proteus group, secondly to enumerate the bacteria which have either been described as members of the group or whose characters presented no features which would enable them to be distinguished from members of the group, and lastly to summarize the constitution and more important characters of the group after the elimination of many bacteria whose retention only leads to unnecessary confusion.

ORIGIN OF THE PROTEUS GROUP.

In 1885, Hauser isolated three supposed new species of bacteria from putrefying animal matter and named them respectively *Proteus vulgaris*, *Proteus mirabilis*, and *Proteus zenkeri*. Their characters were considered to show sufficient differences from those of other bacteria, and sufficient resemblances among themselves, to justify their inclusion in a separate group, and the "Proteus group," by some subsequently called the Hauser

group, was accordingly established. The name was derived from the sea-god Proteus, a deity who had the power to change his form, thus representing the fact that the colonies on gelatine are characteristically irregular (so-called "motile"), producing what have been termed "swarming islands."

The distinguishing feature between the three bacilli described by Hauser was their different power of liquefaction of gelatine, coagulated blood-serum, and casein, the latter represented by the clot formed in milk cultures. Whereas *P. vulgaris* liquefied all these substances rapidly, *P. mirabilis* only liquefied them slowly, and *P. zenkeri* not at all. *P. mirabilis* was also said to show more marked involution forms than *P. vulgaris*, and *P. zenkeri* to produce a less marked putrefactive odour. It is of course now well recognized that such slight differences in the characters of bacteria afford little justification for regarding them as distinct species and providing them with a specific name, and indeed Hauser himself subsequently admitted that the liquefying varieties could be transformed into the non-liquefying.

Koch's discovery in 1881 of plating-out methods for the preparation of pure cultures had already provided a strong impetus to the discovery of new "species" of bacteria, and additions were soon made to the Proteus group. The inclusion of many of these in modern text-books of bacteriology would naturally lead one to suppose that the Proteus group contained a number of different bacteria, whereas on investigation the majority (if not all), with the exception of the original *P. vulgaris*, are found to be obsolete. The group has subsequently attracted but moderate interest, no doubt owing to its comparative unimportance, and it is impossible to identify many of the bacteria which have been described as members. The observations of Jordan in 1903 on the bacteria found in river water enabled him to revise the constitution of the group, and as little has been added to modify his conclusions we accept and quote freely from his results.

Jordan divided his Proteus group into three sections, viz.: (a) *Proteus vulgaris* (type bacillus of the group); (b) Proteus varieties; and (c) *Bacillus cloacæ*. He further subdivided the Proteus varieties into seven types, which exhibited both qualitative and quantitative differences in liquefying power. It is noticeable that Jordan refrained from applying names to these varieties; in fact, he regarded them simply as attenuated strains of *P. vulgaris*. With the exception of diminished liquefying power, and in some cases of an inability to coagulate milk (although all produced acid), the varieties resembled *P. vulgaris* in all respects. The following table (from Jordan) thus represents the sum-total of the differences between *P. vulgaris* and its varieties:—

	Liquefaction of			Milk	
	Gelatine	Blood serum	Casein	Clot	Acid
1. <i>Proteus vulgaris</i> ..	+	+	+	+	+
2. Varieties of <i>P. vulgaris</i> ..	±	±	±	±	+

The inclusion of *B. cloacæ* in the Proteus group is not now generally accepted, even if its existence as a distinct species is admitted. It often, though not always, produces gas in lactose media, whereas *B. proteus* and its varieties are considered to be invariably non-lactose-fermenting. It is more nearly related to members of the Colon group and is usually regarded as a variant of *Bacillus coli communis*, from which it differs in liquefying gelatine, producing acid and gas in saccharose, not fermenting dulcitate, and not producing indol. It also forms more carbonic acid gas than hydrogen in glucose media, that is to say, it has an "inverted" gas formula.

BACTERIA WHICH HAVE BEEN DESCRIBED AS MEMBERS OF THE PROTEUS GROUP, OR WHICH ARE PROBABLY IDENTICAL WITH MEMBERS OF THE GROUP.

(1) *Proteus vulgaris* (syn.: *Bacillus vulgaris*, *Bacillus proteus*, *Bacillus proteus vulgaris*, *Bacterium vulgare*). Isolated by Hauser in 1885 from putrefying animal matter.

(2) *Proteus mirabilis* (syn.: *Bacillus mirabilis*, *Bacillus proteus mirabilis*). Isolated by Hauser in 1885 from putrefying animal matter.

(3) *Proteus zenkeri* (syn.: *Bacillus zenkeri*, *Bacillus proteus zenkeri*). Isolated by Hauser in 1885 from putrefying animal matter.

(4) *Proteus septicus*. Isolated by Babes in 1889 from the intestines of a boy who died of septicæmia. It is probably identical with *Proteus vulgaris*.

(5) *Proteus lethalis*. Isolated by Babes in 1889 from the spleen of a man who died of septicæmia. It was described as non-liquefying and Gram-positive, and was doubtless a variety of *P. vulgaris*.

(6) *Proteus sulfureus* (syn.: *Bacillus sulfureus*). Isolated from water by Lindénborn and Holschewnikoff in 1889. It was probably identical with *Proteus vulgaris*. Subsequently Holschewnikoff isolated a supposed new species, which he called *Bacillus sulfureum*. It was described as a chromogenic organism.

(7) *Proteus hominis capsulatus* (syn.: *Proteus capsulatus hominis*, *Bacillus proteus capsulatus*). This bacillus was isolated by Bordoni-Uffreduzzi in 1888 from two cases of septicæmia. It was described as non-motile, capsulated, Gram-positive, non-liquefying, and not producing a putrefactive odour. It thus differed in cardinal respects from typical members of the Proteus group. In gelatin stabs it produced a nail-shaped growth similar to that of Friedländer's bacillus, and it was probably identical with this or with some members of the Friedländer group.¹

¹ We have seen it stated that *Proteus hominis capsulatus* was possibly identical with *Bacillus pseudo-œdema* which was isolated by Liberius from soil, and later by Sanfelice from soil and animal excreta. The characters of the two bacilli appear, however, to be very different, *B. pseudo-œdema* being described as a strict anaerobe, generally with two oval terminal spores, and producing gas and fœtor but no liquefaction. The only explanation of the apparent contradiction is that the description given of one or other of these bacilli is inaccurate, or alternatively that they are not identical.

It has been credited by some with being the cause of "rag-sorter's disease," but according to others this disease is due to the bacillus of malignant œdema, while others still hold that it is indistinguishable from true anthrax.

(8) *Proteus capsulatus septicus* (syn.: *Bacterium proteus*, *Bacillus capsulatus septicus*). Isolated by Banti in 1888 from a case of acute "hæmorrhagic infection." Banti himself admitted its possible identity with *Proteus hominis capsulatus* of Bordoni-Uffreduzzi.

(9) *Proteus piscicidus versicolor*. Isolated by Babes and Biegler in 1903 from an epizootic in fishes. Probably identical with *Proteus vulgaris*.

(10) *Bacillus murisepticus pleomorphus* (syn.: *Proteus* of Karlinski). Isolated by Karlinski in 1889 from a uterine discharge. Probably identical with *P. vulgaris*.

(11) *Bacillus figurans*.—Under this name two different bacilli have been described. Both were isolated by Vaughan from water in 1892. One was probably identical with *P. vulgaris*, and the other with *Bacillus mesentericus vulgatus*.

(12) *Bacillus "A" of Booker*. Isolated by Booker in 1887 from the stools of children with "cholera infantum." Probably identical with *P. vulgaris*.

(13) *Urobacillus liquefaciens septicus*. Isolated by Krogus from urine in 1890. Probably identical with *P. vulgaris*. It may be remarked that the "urobacilli" of Miquel were spore-forming organisms and such a name applied to a member of the *Proteus* group would be out of place.

(14) *Bacillus zopfii* (syn.: *Bacterium zopfii*). Isolated by Kurth in 1883 from the intestines of chickens. Probably identical with non-liquefying strains of *P. vulgaris*. The expression "Zopfii group" is sometimes used as a sub-group of the *Proteus* group containing the non-liquefying varieties.

In addition to the above, it is at least possible that many of the bacteria which have been at different times isolated from water, soil, and other sources, and which have received distinctive specific names, were identical with *P. vulgaris* or with one of its varieties. Jordan points out, for instance, that bacteria of the *Proteus* group may produce a yellowish or buff-coloured growth on agar, potato, and in milk; and it is therefore probable that many of the bacteria described as chromogenic—and possibly on that account excluded from the *Proteus* group—were either identical with or closely related to *P. vulgaris*. Among such may be mentioned, according to Jordan, *B. radiatus* (Luderitz), *B. ochraceous* (Zimmermann), and *B. arborescens* (Frankland). The fact that their pigments were originally described as golden-yellow did not deter Jordan from considering that they were possibly members of the *Proteus* group. Varieties of *P. vulgaris* producing fluorescence have also been described, notably by Etienne and Jirou, and by Jaeger.

Finally, although not strictly a member of the *Proteus* group, mention

may be made of *Bacterium termo* (Dujardin, 1841). This was originally used as a comprehensive term for all the motile bacteria found in putrefying infusions, and it therefore included bacilli of the Proteus group. Later Vignal applied the same name to a motile liquefying chromogenic bacillus which he isolated from the saliva of healthy persons. The word is still occasionally used as if it were synonymous with *P. vulgaris*, which it is not, and it is to be regarded as obsolete. It would serve no useful purpose to consider further the names of possible members of the group, since it is quite impossible to identify many of the bacteria described by early observers. Little reliance can be placed on the accuracy of their observations of the cardinal points of differentiation between different "species" of bacteria.

The purpose of the above summary is to indicate that, with the exception of the specific name Proteus vulgaris, or preferably Bacillus proteus, all names which have been given to members of the Proteus group should be regarded as obsolete—at any rate until such time as modern bacteriological methods enable a proper recognition of species to be made.

There is no advantage to be gained in taxing the memory with names which have no practical significance, and it would be fortunate if textbooks were to entirely discard all those which are unnecessary. Under these circumstances the constitution and more important characters of the Proteus group may be described as follows:—

THE PROTEUS GROUP.

Members of the Group.

(1) *Bacillus proteus* (*B. proteus*).—This is the only member of the group. Certain strains have a diminished power of liquefaction of gelatine, casein, and coagulated blood-serum, and some are also unable to form a clot of milk (although all produce acid). Some strains have also a limited chromogenic and fluorescing power. All names for these strains, varieties, or variants, are superfluous and should be regarded as obsolete. In all other essential respects the characters of the strains of *B. proteus* may be considered as practically identical with those of *B. proteus* itself. The following may, therefore, be taken as representing the characters either of *B. proteus* or of the group as a whole.

CHARACTERS OF *B. proteus*.

(a) *Morphology*.—Bacilli with rounded ends, varying greatly in length (i.e., markedly pleomorphic), from short stumpy forms to long slender rods and filaments. Average length three microns, breadth 0·5 micron. Actively motile and flagellated (flagella abundant and peritrichal). Non-sporing.

(b) *Staining Reactions*.—It stains only fairly well with the usual aniline dyes. Previous treatment with iodine or potassium permanganate is said

to improve the staining. Gram-negative (some strains are said to retain the stain, but this is doubtful).¹

(c) *Cultural Characteristics*.—A facultative anaerobe. The optimum temperature is about 25° C., but it will grow quite readily at 37° C. Cultures have a putrefactive odour, and those on solid media are moist. *Broth*: Rapid clouding, formation of a pellicle and sediment. *Agar*: Dirty white growth. Colonies at first circular, later markedly amoeboid (i.e., unevenly spreading). *Gelatine*: Rapid liquefaction. Under anaerobic conditions liquefaction is diminished, or even inhibited. *Blood serum*: Rapid growth and liquefaction. *Potato*: Dirty greyish growth. The possible production of pigmentation and fluorescence by some strains has already been referred to.

(d) *Fermentation Reactions*.—Lactose, no change; glucose, acid and gas; saccharose, acid and gas; litmus milk, acid and clot. The clot is subsequently digested owing to liquefaction of the casein. Some strains do not clot. Indol production, usually present.

(e) *Pathogenicity*.—*Bacillus proteus* appears to be as a rule a harmless organism, but there is evidence that under certain circumstances it may become pathogenic. Thus it has been described as the cause of epidemics of foot-poisoning, of choleraic diarrhoea in infants, and of cystitis. In obscure cases of these diseases the possibility of its etiological significance should not be lost sight of. The practical importance of the *Proteus* group depends chiefly on the fact that the bacilli are frequently met with in bacteriological examinations for well-known pathogenic organisms, and it is necessary to eliminate them by a study of their cultural characters and fermentation reactions. Beyond the production of localized abscesses when injected subcutaneously in large doses, and the production of toxæmia by large doses of filtered cultures given intravenously or intraperitoneally, animal experimentation does not indicate any marked pathogenicity of the group.

(f) *Occurrence*.—Water, air, soil, sewage, putrefying animal matter, bowel contents and stools, abscesses, chronic aural and nasal discharges, urine in some cases of cystitis (the urine is alkaline in these cases), and the tissues after death.

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Clinical and other Notes.

A METHOD OF TEACHING THE FRONT LINE APPLICATION OF THOMAS'S SPLINT BY NUMBERS.

BY LIEUTENANT-COLONEL E. M. COWELL, D.S.O.

Royal Army Medical Corps (Special Reserve).

For the past three and a half years the principles of splinting fractures of the thigh and certain severe injuries of the leg, as early as possible, and with the least amount of anatomical disturbance, have been gradually making headway. This became feasible by the introduction of the Thomas's splint in sufficient numbers to permit of immediate application in forward areas. From several centres this practice spread until, owing to the work of Colonel H. Mc.I. W. Gray, A.M.S., in the first battle of Arras, in April, 1917, it was possible to organize and establish this system of treatment on a large scale.

In November, 1917, it fell to the writer's lot to teach the "Front line application of the Thomas's splint" to large classes of medical officers, N.C.O.s., and other ranks of the Royal Army Medical Corps, as well as regimental stretcher bearers. For this purpose a system of teaching as a "Splint Drill" by numbers was devised, and found to give good results.

The application of the splint was divided into twelve distinct steps, simple detail being given with each movement. For the purpose of instruction, the class was divided into "teams," made up as far as possible from personnel drawn from the same units. Each team was allotted to its own stretcher, and consisted of an "operator," first and second assistants, and a "patient." Every member of the team changed places after each application, and was thus given ample opportunity of mastering all the details.

From the teacher's point of view it was found easy to control each step, and check faults if they occurred. I have been able to teach single-handed a class of 160 men, none of whom had any previous knowledge of the Thomas's splint. From the learners' standpoint the steps were found to follow in logical sequence, and to be easy to remember. Practice made the application automatic, and the drill became a question of discipline. It was found in actual practice that a well-trained team did its work quietly and smoothly without flurry or nervousness, even under fire. In addition to these advantages, the drill gave to the senior members of the class a simple method of instruction, which they themselves made use of on rejoining their units.

It has been thought worth while to publish this "Splint Drill" in the Corps Journal, since it has now stood the test of over twelve months' actual experience both in the Royal Army Medical Corps Schools in France and in those of some of our Allies, as well as in certain of the Training Depots in England.

To Major-General H. N. Thompson, C.B., C.M.G., D.S.O., is due the credit of insisting for the past two years on the importance of teaching this front line method. The details herein described were worked out from suggestions made by Major-General Cuthbert Wallace, C.M.G.

FIRST ARMY. FRONT LINE APPLICATION OF THOMAS'S SPLINT.

Drill by Numbers.

The Thomas's Outfit consists of: Stretcher on trestles; blankets, three; Primus stove; Thomas's splint (largest size); reversible stirrup (Sinclair's); suspension bars, two; flannel bandages (six yards), three; triangular bandages, four; dressings; safety pins; Gooch splinting (10 inches by 6 inches and 8 inches by 6 inches).

Personnel required: Operator, one. No. 1 assistant; No. 2 assistant (if available).

When not in use the splint is kept hung up. The five slings of flannel bandage are rolled round the inner bar of the splint, the leather is kept soft by saddle soap, and the iron bars are smeared with vaseline.

Indication of Front Line Application.—(1) For all fractures of the thigh bone, except where there is an extensive wound in the upper part of thigh or buttock, which would interfere with the fitting of the ring.

(2) In severe fractures about the knee-joint or upper part of the leg.

(3) In certain cases of extensive wounds of fleshy part of thigh.

Detail of Thomas's Splint Drill.

On the word "One."—The stretcher, placed on trestles with a Primus stove beneath, is prepared as follows: The first blanket is folded lengthwise into three, two folds lie on the stretcher, one hangs over the side. The second blanket is arranged in the same way, one fold hanging over the other side of the stretcher. The patient is now placed on the prepared stretcher and lies on four folds of blanket; the two folds hanging down form a hot-air chamber. The third blanket is placed across the patient's chest while the splint is being applied.

On the word "Two."—The No. 1 assistant stands at the foot of the stretcher facing the patient and opposite the injured limb. Grasping the heel of the boot with his right hand and the toe with his left, keeping the arms straight, he exerts a steady pull, thereby producing the necessary extension. The No. 2 assistant supports the injured part above and below the fracture.

On the word "Three."—To form the clove-hitch, the operator takes a length of nine feet of flannel bandage. Holding it in the left hand by its mid-point, he grasps the centre of the left half with his right hand, palm to the right, and makes a loop by rotating the right hand through half a circle. This loop is carried up and passed in front of the left hand, thus forming a clove hitch with a diameter of ten inches. This is applied over the boot so as to surround the ankle and leave both ends on the outer side. The long end is carried under the instep, up and through the loop round the ankle. Two extension bands are thus produced ready to be attached to the splint later on. A pad prevents undue pressure on the back of the foot and care must be taken not to constrict the ankle.¹

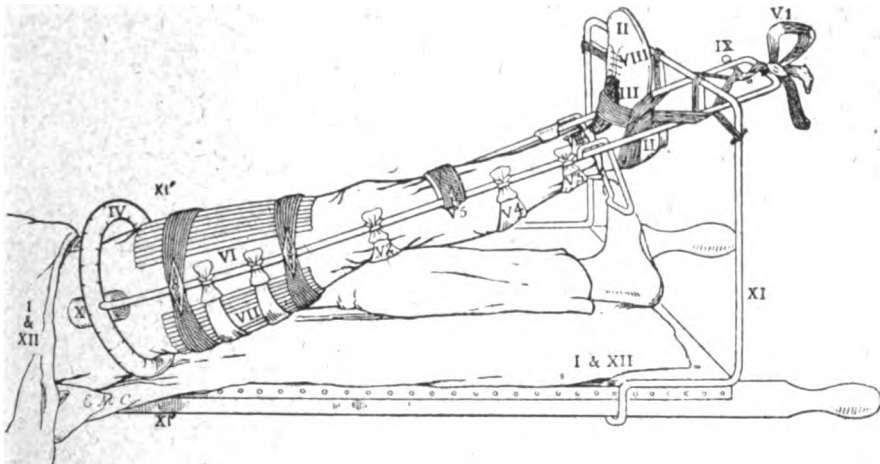
¹ I am much indebted to Lieutenant-Colonel A. M. H. Gray for help in the wording of this rather complicated detail.

On the word "Four."—The operator threads on the splint; No. 1 assistant removing and re-applying upper and lower hands alternately to allow the ring to be passed over the foot. The splint should be pushed up under the buttock as far as possible, care being taken to keep the notched transverse bar horizontal. No. 2 assistant, as before, steadies the thigh.

On the word "Five."—(1) The extension bands of the clove-hitch are tied round the notched bar at the end of the splint as follows: The outer band is passed over and under the bar, round the notch, drawn taut, and held over to the opposite side. The inner band is passed under and over the bar, then also round the notch where it crosses the first band and prevents its slipping. The two are finally tied off by a half bow.

(2) The middle sling is tied off over the outer bar, No. 2 assistant keeping the knee partly bent.

DETAIL BY NUMBERS.



I, warming (Réchauffement); II, extension; III, modified clove-hitch over boot; IV, splint; V, fixation of leg; VI, dressing wound of thigh; VII, Gooch splint and triangular bandages; VIII, figure-of-8 and stirrup; IX, Spanish windlass; X, pad in ring; XI, suspension bar; XII, a second bar is now added; XII, hot water bottles and blankets.

(3 and 4) The slings behind ankle and calf are tied, so that the leg rests in a shallow trough, half in and half out.

(5) To prevent the leg rising off the splint a narrow fold bandage is placed across the leg, just below the knee; the ends are carried down between the leg and splint, brought up outside the bars, and tied off. The lower limb is now firmly fixed in a position of extension and it may be moved without causing pain to the patient or damage to the injured part.

On the word "Six."—The wound is exposed by cutting away the overlying portion of trousers on the wounded part of the thigh, and the dressings are applied.

On the word "Seven."—The Gooch splints are now applied. The short piece is placed behind, and secured by tying the remaining two slings. The long piece is placed on the front of the thigh, care being taken to avoid pressure on the knee-

cap. The whole is now retained in position by two narrow fold bandages, carried round the thigh outside the bars of the splint.

On the word "Eight."—The stirrup is "sprung" on to the splint above the ankle, its foot towards the stretcher. A bandage is then applied to form an additional sling, which by a figure-of-8-turn prevents lateral movement of the foot.

On the word "Nine."—The extension bands are tightened, and a small piece of wood or a nail is introduced to increase the tension by twisting up as required.

On the word "Ten."—A pad is placed inside the ring on the outer side of the thigh to act as a wedge and prevent undue movement.

On the word "Eleven."—The suspension bar is fitted to the stretcher with the "grip" away from the rackets. The splint is slung up not less than six inches from the horizontal part of the suspension bar. To damp down the side movements, lateral tapes are tied to the uprights; they should not be tight. For the journey in the motor ambulance an additional band may be passed from the splint round one handle of the stretcher; this prevents excess of vertical movement. To prevent the ring slipping up into the groin a second suspension bar is applied and the upper part of the splint slung as shown in the fig. (XI').

On the word "Twelve."—Hot bottles are applied. The third blanket is folded into two lengthwise, and laid over the patient. The hanging folds of the first and second blankets are brought up over this so that the patient is evacuated with four folds of blanket on top as well as underneath.

RELAPSING FEVER: A ROUGH BUT EFFECTIVE METHOD OF DEALING WITH THE LOUSE IN INDIA.

BY LIEUTENANT-COLONEL WANHILL.

Royal Army Medical Corps.

DURING the hot weather of last year, 1918, an extremely virulent epidemic of relapsing fever occurred among the Indian population of the United Provinces India. As the strength of the Indian Army was being increased enormously, as rapidly as possible, the influx of recruits into the United Provinces cantonments was very considerable. Besides recruits for combatant corps other corps had been formed, notably supply and transport corps, drivers and labour corps. The class of recruits for these last two corps was, as one might suppose, much lower than that for the combatant corps, and hence were more likely to be infested. In Lucknow alone the Indian garrison had risen from approximately 4,000 in peace time to about 25,000, of which 5,000 were supply and transport, drivers under training, and some 4,000 labour corps. As, however, the danger of introduction of infectious disease, from villages, by the class of men recruited for the above corps, was recognized early, care had been taken to secure a considerable interval between the camps of these men and the lines of the combatant corps depots.

The epidemic commenced suddenly in the 5th Mule Corps Depot, a very large number of men being attacked, and all dying in a week. Matters were so serious

that even the sub-assistant surgeons who were told off to look after the patients were attacked, and consequently incapacitated, while the nursing staff were similarly affected.

It was obvious, therefore, that the matter was very serious and that, whatever methods were adopted to prevent the spread of the disease, they had to be effective and capable of being quickly applied.

In consultation with the Senior Medical Officer, Indian Medical Service : (a) The whole of the 5th Mule Corps was placed under canvas in two sanitary camps situated about two miles from cantonment and within easy distance from the river; (b) orders were issued that all the men of this unit were to be marched to the river twice daily to wash themselves and their clothes; (c) a circular on the measures necessary to prevent the disease was sent to all units in the cantonment and published in Station Orders.

The first measure ensured that the huts, which had been occupied by the infected unit, were left vacant during the period considered necessary for covering the incubation period, i.e., thirteen days. It was impossible to disinfect the huts by mechanical means, as they were of crude brick with mud floors and impossible of closure. It was considered that the lice, having no persons to feed on, would in that time die of starvation.

As there was an Indian village at a short distance from the camps, there was a potential danger of re-infestation from the villagers. This was got over by the placing of guards on the village to keep it out of bounds.

The washing of the men at the river did not in any way offend their caste prejudice, as cleanliness, though not always attended to, is part of their religion. Indian officers were told off to see that the washing was done properly, and if necessary, the process was assisted. The men, having washed his clothes, which, in India, are few and simple, placed them on the hot sand to dry in the sun, then took them to some other spot and shook them well. Anyone who has experienced a Lucknow hot weather will know that the sand, in the sun, is so hot as to be untouchable by the hand. This diurnal cleansing and drying of clothes was considered to be an efficient disinfesting method since the living lice would be removed by the washing and killed by exposure to the sun, while the eggs would be desiccated by the same agency. Tents were struck daily, turned inside out and exposed to the sun.

The men's hair was cut where their caste permitted, and the cuttings swept up and burnt. In the case of castes who are not allowed to cut their hair, oiling and combing were recommended. There was, however, little danger of lice with these castes as the care of their hair occupies them a considerable time every day. These precautions seem to have been sufficient as, beyond men who had been infested in the huts prior to moving into camp, no further cases occurred.

The dangers of moving into camp were exemplified, however, as towards the end of the isolation period cholera broke out, owing to the impossibility of keeping the men from contact with civilian natives in such an undisciplined unit. This was promptly got under control by moving the corps back into the huts, where they could be controlled. (b) Instructions were issued to all units, pointing out the mechanism of infection by the louse, stipulating for the isolation and inspection of all recruits, and the cutting of their hair. The men of all units

were also marched to the river twice weekly to wash themselves and their clothes. In a disease due to infestation where the conveying agent is macroscopic, if the cause of the disease is explained, company officers and Indian officers will themselves ensure that their men are not verminous. The men themselves, in Indian combatant units, being of a good class, will take care to keep themselves clean.

The practical results of these prophylactic measures was the complete stoppage of the epidemic from the day of commencement.

It is recognized that the methods were rough but ready. The difficulty of obtaining even barrels in India, owing to the war and the necessity for prompt action, prevented the establishment of the methods used in Europe, while the heat of the Indian sun was readily obtainable as an insecticide. It is regretted that, owing to the great shortness of medical staff and to the large amount of work that had to be done in connexion with the cases in hospital, no tests could be made of the exact action of the sun's rays and desiccation. Practical experience of the discomfort of sitting down on sand, exposed to the sun's rays at midday, makes it probable that the heat and dryness was not appreciated by the louse or by the eggs.

Paraffin ointment was used on the hair of some of the men, but here again the caste prejudices had to be considered. The cutting of the hair short got rid of nits, while the scrubbing of the head in the river evicted the louse.

Simplicity and rapidity is the essence of any method of checking disease, and it is thought that in countries with a climate like India, the above method is the simplest and has the merit of having been effective.

AUSTRIAN "TOMMY'S COOKER."

By MAJOR T. THOMPSON.

Royal Army Medical Corps.

The following description of Austrian pattern "Tommy's Cooker" may be of interest. The actual cooker consists of three strips of iron about seven inches

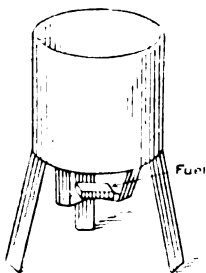


FIG. 1.

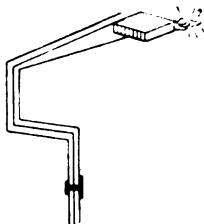


FIG. 2.

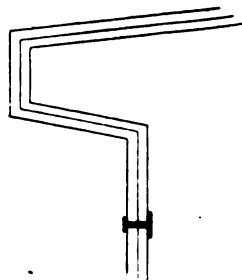


FIG. 3.

long, bent as shown in accompanying diagram (1). The three pieces are rivetted by the horizontal bend of each piece. These form when closed a very easily portable article, as the three pieces fold into one, and the whole can be

easily carried in a small pocket. When open it forms a tripod having a horizontal centre, as shown in accompanying Fig. 1, on which the fuel is placed, and three outer raised points on which any cooking utensil can be rested. The fuel consists of small squares of grease-soaked paper material, each individual piece being about 1 inch square and $\frac{1}{4}$ to $\frac{1}{2}$ inch thick. They appear to be made of paper pulp boiled in crude fats and then allowed to cool, and sections stamped out by machinery. These are very readily portable, do not deteriorate with damp or wet, and boxes of this fuel are very light, and a handful of pieces can be readily carried in each man's pocket without inconvenience. The fuel burns with a steady slightly white flame at a comparatively slow rate. Each piece of fuel is sufficient to heat a pint mug of water to boiling point. The fuel is used by placing it on the tripod centre, or if the tripod cannot be used, a piece of fuel can be pinched between the arms of the tripod when folded, and used practically as a candle.

It appeared to me this type of cooker would be extremely convenient for our own Royal Army Medical Corps work, especially in dressing stations and regimental aid posts, where small quantities of hot water are wanted at short notice, and fuel, particularly methylated spirits, is hard to obtain.

The easy portability of the article itself and its fuel is very marked when compared with our own "Tommy's Cooker," and a man can readily carry one of these cookers, a handful of fuel which would last twenty or thirty times, and a box of matches in his pocket without any inconvenience.

INTRAVENOUS INJECTIONS OF ANTIMONIUM TARTARATUM (TARTAR EMETIC) IN BILHARZIASIS.

By FRANK E. TAYLOR, M.D., M.Sc., F.R.C.S., D.P.H.

Lecturer on Bacteriology University of London, King's College; Pathologist and Bacteriologist to the Bermondsey Military Hospital.

OWING to the great and important advances which have recently been made in our knowledge of the subject of bilharziasis much attention has been attracted to this condition. These advances are chiefly due to the work of Leiper [1], Fairley [2, 3] and Christopherson [4, 5].

In 1915 Leiper [1] succeeded in working out the complete cycle of development of the Bilharzial worms, giving a connected story of their life-history. He found the non-eyed, bifid-tailed cercariæ characteristic of the genus in two different genera of snails, *Bullinus contortus* and *Planorbis boissyi*. These snails were shown to harbour two different species, namely *Bilharzia hæmatobia* which is characterized by a terminal-spined ovum and *Bilharzia mansoni* which is characterized by a lateral-spined ovum.

Fairley's [2, 3] work demonstrated how bilharzial parasites and their excretions exert a deleterious influence on the tissues of their definitive host, man, mainly by the production of toxins and not merely mechanically. These toxins call into action cellulo-humeral responses which neutralize or limit their activity. As a result immune bodies, including complement-fixing substances, are pro-

duced, and a complement fixation test for bilharziasis has been devised by Fairley, comparable to the Wassermann test for syphilis. As antigen an alcoholic extract of the infected livers of snails (*P. boissyi*) was employed. Positive complement fixation was obtained in a high percentage of cases in man as well as in experimentally infected monkeys. The practical application of this test Fairley considers will facilitate the diagnosis of bilharziasis in the early stages of the disease before localizing symptoms have developed, and also in estimating the effect of the intravenous administration of drugs on the adult parasite.

Christopherson [4, 5] introduced, or independently re-introduced, the administration of intravenous injections of solutions of tartarated antimony (tartar emetic) with success, and claims that this method constitutes a specific cure for the disease. It was the satisfactory results obtained by himself and others, by the use of this method, in cases of Oriental sore, internal leishmaniasis and naso-oral leishmaniasis (espundia) as found in the Sudan which induced Christopherson to apply it to the treatment of bilharziasis, both vesical and rectal. This method of treatment of bilharziasis was commenced by him in the Khartoum Civil Hospital in May 1917. In September 1918 he recorded thirteen cases of *Schistosomum hæmatobium* treated by this method with apparently complete cure in all the cases, but with relapses in from one to eight months in three cases. As the result of his experience he considers that "there is no doubt that antimony given as intravenous injections of tartar emetic considerably interferes with the bilharzia and suspends its activities, even when it does not actually kill. My own opinion, based on the cases treated during the last year, is that antimony (antimony tartrate) is a definite cure for bilharziasis, and that intravenous injections of tartar emetic kill the *Schistosomum hæmatobium* in the blood and render it harmless."

Christopherson's method consisted in giving a course of injections on alternate days for a period of fifteen to thirty days commencing with $\frac{1}{2}$ grain dissolved in six cubic centimetres of distilled water and increasing by $\frac{1}{2}$ grain up to 2 grains until a total of 30 grains have been injected. This is the amount which he considers to be the required killing dose notwithstanding the fact that all the symptoms of the disease often completely disappear after the first or second injection.

The following ten cases of bilharziasis of the bladder have recently been treated by this method at the Bermondsey Military Hospital:—

Case 1.—Pte. C., admitted to the Bermondsey Military Hospital on September 21, 1918, under the care of Dr. R. H. Townend for bilharziasis for which he was sent straight from Egypt. He first noticed blood in the urine when in Egypt in August, 1916. Terminal-spined bilharzia ova were found on that date, and he was classed B3. He had been bathing in the canal at intervals for nine months. Since the original attack he has twice been in hospital for hæmaturia and general weakness. Has had loin and bladder pains without intermission since onset of the disease. On admission to the Bermondsey Military Hospital patient complained of pain in the urethra and of passing red urine. Microscopic examination of the urine on September 24 showed the presence of much blood and many terminal-spined bilharzia ova. Treatment with antimonium tartaratum intravenously was begun with $\frac{1}{2}$ grain on October 9, 1918. The dose was gradually raised to 2 grains and the injections were given

about every other day until December 2, 1918, when a total of $29\frac{1}{2}$ grains in seventeen injections had been given. Blood was found in the urine microscopically for the last time on October 26, and no ova were found after the commencement of the treatment. Stiffness of the neck and shoulder muscles was the only thing patient complained of after the injections. He was discharged well on December 12, 1918.

Case 2.—Pte. T., aged 27, East Riding Yeomanry, was admitted to the Bermondsey Military Hospital on September 21, 1918, under the care of Captain F. Talbot, R.A.M.C., having been transferred straight from Egypt for bilharziasis. He was admitted to the Onwa El Worka General Hospital on July 27, 1918, having been stationed in the Fayoum for thirteen months previously, where he contracted the bilharziasis and was unable to carry on with his unit. He complained of pain in the lower abdomen and passing blood in the urine. Blood, albumin and terminal-spined bilharzia ova were found in the urine. On admission to the Bermondsey Military Hospital he complained of weakness and of pain in the hypogastrium, with burning pain along the urethra on micturition. There was blood in the urine every day towards midday, and any exertion made this condition worse. Patient said he had lost seven pounds in weight in the last three weeks. Repeated examination of the urine always showed the presence of albumin, blood-cells and terminal-spined bilharzia ova. Large numbers of ova were found on November 16, 1918, but from January 9, 1919, no albumin, blood, or ova were ever found. Antimonium tartaratum was intravenously injected in $\frac{1}{4}$ -grain dose on September 28, 1918, but on account of some induration at site of injection this treatment was suspended and was resumed on November 14, 1918, the dose being gradually raised to three grains. A total of ten injections and $21\frac{1}{2}$ grains of antimonium tartaratum were given, the last injection being given on December 11, 1918. Patient then went for twelve days Christmas leave. On his return he felt quite fit, having been free from symptoms during his leave, and the urine was free from albumin, blood, and ova. He was "dispersed" on January 20, 1919.

Case 3.—Cpl. B., A.S.C., aged 29, with eight years' service, was admitted to the Bermondsey Military Hospital under the care of Captain F. Talbot, R.A.M.C., on September 21, 1918, having been transferred to England from Egypt for bilharziasis. He was stationed in the Fayoum district of Egypt in 1915-1916 where he developed hæmaturia, dysuria and pain, and was boarded in July, 1917, for bilharziasis. At the Onwa El Worka General Hospital in 1917 he complained of hæmaturia with abdominal pain and pain at the end of micturition, having been ill for a year and becoming worse. Bilharzia ova along with blood and albumin were present in the urine. When admitted to Bermondsey Military Hospital patient stated that he passed more blood than usual owing to the fatigue of the journey, exertion always producing this result. Examination of the urine on September 24 showed the presence of some red blood cells and a trace of albumin, but no ova were found. On October 8, albumin and red blood cells were abundantly present and bilharzia ova were found. Intravenous injections of antimonium tartaratum were commenced with $\frac{1}{4}$ grain on October 2, 1918, increasing by $\frac{1}{4}$ grain twice weekly, 3 grains being reached on November 29, this dose being repeated five times. By November 17, a total of $27\frac{1}{2}$ grains had been given. A few red blood cells were found in

the urine on November 16, but no ova and frequent subsequent examinations failed to reveal any ova or red blood cells. Cough and irritation of the throat were complained of after several injections and vomiting occurred after the first injection of three grains. Patient went for twelve days' leave and returned feeling quite fit and free from all symptoms. Was "dispersed" on December 18, 1918.

Case 4.—Spr. S., R.E., aged 39, with three and half years' service, was admitted to the Bermondsey Military Hospital on September 21, 1918, under the care of Dr. R. H. Townend. Went to Egypt, December, 1915. Began to pass blood and clots in urine in November, 1916. Infection said to be due to bathing in fresh water tank under Royal Army Medical Corps control.

In addition to hæmaturia he complains of burning sensation at end of micturition, with general weakness, wasting and anæmia. Weight has fallen from 14 stone to 10 stone 7 pounds.

Urine examined September 24, 1918, showed the presence of terminal-spined bilharzia ova, red blood cells and a trace of albumin. Ova were never subsequently found and no red blood cells after October 2, 1918. Intravenous injections of antimonium tartaratum commenced October 9, 1918, with $\frac{1}{2}$ grain in five cubic centimetres distilled water, gradually increased to two grains. A total of seventeen injections and $27\frac{1}{2}$ grains antimonium tartaratum given, the last on November 29, 1918. Complained at various times after injections of irritation in throat with tickling cough, nausea, vomiting, diarrhœa and stiffness in muscles of neck and shoulder. Discharged well December 4, 1918.

Case 5.—Pte. L., aged 22, with three and a half years' service, was admitted to the Bermondsey Military Hospital on September 8, 1918, under the care of Dr. R. H. Townend. Had been in Egypt since April, 1916. Hæmaturia commenced in January, 1917. Reported sick July, 1918, complaining of pain in the back and passing blood in the urine and general weakness so as to be unable to carry on. Was exposed to infection from the water of a sweet water canal at Elkuton, Egypt. Has gradually got weaker. Has been in hospital in Egypt three times and was sent home for bilharziasis, terminal-spined bilharzia ova having been found in the urine. The longest interval free from symptoms was two months.

September 24, 1918: Urine showed a trace of albumin and a few red blood cells, no ova found. Has been free from urinary discomfort lately.

September 27, 1918: Micturition frequent, but no pain.

October 3, 1918: Urine contained calcium oxalate crystals and a few leucocytes, but no ova or red blood cells found. Had occasional bladder pains.

Intravenous injections of antimonium tartaratum commenced October 9, 1918, with $\frac{1}{2}$ grain dissolved in six cubic centimetres of distilled water. Next day a few red cells in urine.

Subsequently neither ova nor red cells were found. A total of seventeen injections and twenty-nine grains was given ending on December 13, 1918. Had a slight rigor with temperature of 103° F. after thirteenth injection, two grains, total $22\frac{1}{2}$ grains. Other symptoms were nausea, vomiting (twice), headache, pain in the body and shakiness of the feet. Was discharged December 19, 1918, fairly fit and free from bladder symptoms.

Case 6.—Pte. M., Area E. Co., aged 21, with five years' service, was admitted to the Bermondsey Military Hospital under the care of Dr. R. H. Townend, September 21, 1918, having been sent direct from Egypt, where he had been

since December, 1915. Bathed in sweet water canal in May, 1916, previous to this being forbidden. First had hæmaturia May, 1917, was in hospital five weeks and classed B2 on July 18, 1917. Had never been free from blood in urine and pain in loins for more than three days at a time. Again reported sick July, 1918, for general weakness. On admission was passing red urine and complained of pains in the loins. Urine examined on September 24, 1918, showed a trace of albumin, an abundance of red blood cells and many terminal-spined bilharzia ova.

Began intravenous injections of antimonium tartaratum on October 9, 1918, with $\frac{1}{2}$ grain in six cubic centimetres of distilled water, gradually increasing doses every other day up to two grains. A total of eighteen injections and $30\frac{1}{2}$ grains administered, the course finishing November 29. Symptoms produced were immediate cough, slight giddiness, vomiting (twice) slight diarrhoea and stiffness in the muscles of the shoulder.

There was no relapse of the bladder symptoms when patient was discharged on December 19, 1918.

Case 7.—Lance-Cpl. D., Warwicks, aged 22, with five years' service, was admitted to the Bermondsey Military Hospital on September 9, 1918. Went to Egypt November, 1915, and reported sick on August 17, 1918, complaining of pain in the lumbar region, passing blood in the urine and unable to carry on. Had first noticed blood in the urine in October, 1916, at Fayoum, Egypt. Infection said to have been contracted from sweet water canal. Has had incessant hæmaturia from the start, with constant aching pain over bladder and in the small of the back for three months. Also scalding pain on micturition.

October 3, 1918: A good deal of blood and bladder pain. Urine contained terminal-spined bilharzia ova, red blood cells and a trace of albumin.

October 7, 1918: Sharp shooting bladder pains and urine more bloody than usual. Began treatment with intravenous injections of antimonium tartaratum ($\frac{1}{2}$ grain in five cubic centimetres distilled water) on October 11, 1918. Gradually increased to two grains every other day. Treatment consisted of sixteen injections and a total of twenty-nine grains and ended on November 26. Nausea, slight diarrhoea and muscular stiffness in neck and shoulders complained of during treatment. Blood and ova last found in urine October 24, every subsequent examination being negative. Weight increased during treatment from 10 stone 7 pounds, to 11 stone $4\frac{1}{2}$ pounds.

On discharge patient states that he has now no symptoms except slight weakness.

Case 8.—Pte. G., R.A.F., aged 23, with five years' service, was admitted to the Bermondsey Military Hospital, under the care of Dr. A. E. Wilson, on January 17, 1919, having been sent from Egypt for bilharziasis, arriving in England December 15, 1918. Was in Egypt October, 1915, to December, 1918. Believes he was infected in Fayoum district 1915 to 1916. Blood noticed occasionally in urine for a year before reporting sick November, 1917. The frequency of hæmaturia gradually increased from about once a month to every day, so that except for first thing in the morning patient never passed urine without observing blood in it for about a year before returning to England. Blood and bilharzia ova abundant in urine till February 8, 1919.

Intravenous injections of antimonium tartaratum commenced January 28, 1919, with $\frac{1}{2}$ grain. Doses twice weekly increasing by $\frac{1}{2}$ grain till March 11, 1919, eight doses and three grains being given. Total $31\frac{1}{2}$ grains.

No symptoms followed injections except a temperature of 100° F. one night after three grains and a total of 19½ grains, and general pruritis after the last injection but one. No urinary symptoms, last time blood being seen in urine three weeks ago. Colour much better and patient feels stronger and better.

Case 9.—Cpl. M., R.A.S.C., aged 30, with four years' service, was admitted to the Bermondsey Military Hospital on October 12, 1918, under the care of Dr. A. M. Cato from H.M.A.T. Essequibo, direct from Egypt, where he had been since October, 1915, being stationed in the Fayoum Province till October, 1916, when he went to Palestine. Symptoms first noticed February, 1917, passing blood in urine with sharp pain in urethra during micturition, with left hypogastric pain. The hæmaturia was at first intermittent about once a week, later every day. Reported sick at Bela in June, symptoms being more marked with headache and general weakness, so that patient could not carry on any longer. Symptoms less severe while resting in hospital.

Urine examinations showed the presence of terminal-spined bilharzia ova and blood cells on January 16, 1919. Several examinations in March negative. Intravenous injections of antimonium tartaratum were commenced December 10, 1918, with ½ grain. Interrupted by twelve days Christmas leave and again for a week in February because of a severe cold. Injections given twice a week and gradually increased till three grains was reached on February 2. Injections finished February 28, total thirty grains. During injections patient lost weight from 10 stone 4 pounds to 10 stone. Had much irritative cough at end of injections and complained much of headache after injections (patient had some error of refraction which has since been corrected by glasses).

No bladder pains or symptoms and no blood in urine since January 20. Still has slight dull pain in small of back. Patient considers he is weaker and more easily tired than before submitting to injections.

Case 10.—Pte. C., aged 25, with seven years' service, was admitted to the Bermondsey Military Hospital on November 12, 1918, under the care of Dr. J. Howard Cook. He was perfectly fit until being sent to Egypt in September, 1915. He was stationed in the Fayoum Province until November, 1916, when he was sent to Palestine. He started passing blood in the urine at first very intermitently, but gradually getting worse, but did not report sick until March, 1917. He was sent back to Cairo in May, 1917, and there the diagnosis of bilharziasis was established, terminally-spined bilharzia ova having been found in the urine. He returned to England in October, 1918, and was sent direct to the Bermondsey Military Hospital. Intravenous injections of antimonium tartaratum were commenced on December 6, 1918, beginning with ½-grain dose and gradually increasing up to three-grain doses at bi-weekly intervals until March 12, 1919, with an interval of three weeks because of an attack of influenza. A total of 30½ grains was given. Bilharzia ova, blood and albumin were found on examination of the urine on October 10, 1918. Blood was occasionally passed until February, 1919, but ova were not found after the commencement of the injections. At the end of the course of injections the urine was free from ova, blood and albumin, but patient still complained of pains in the back and over the bladder. During the following week there was a relapse of the hæmaturia with more pain on micturition and headache, and examination of the urine showed the presence of red blood cells, granular epithelial cells and calcium oxalate crystals,

but no bilharzia ova were found. Patient was then transferred to 4th London General Hospital.

In all these cases the solutions used in the injections were made by dissolving the tartar emetic in freshly distilled sterile water at the strength of one grain in six cubic centimetres and then sterilized by autoclaving for one hour. At first the injections were administered every two days with a maximum dose of two grains, whilst on the later cases of the series I worked up to doses of three grains administered twice a week.

No serious drawback, no marked toxic manifestations, and no severe reactions followed the injections. With one exception all the patients were troubled with irritation of the pharynx and a spasmodic outburst of coughing either during or after the injections, usually just at the end of their administration. In four cases stiffness and cramp of the muscles of the neck and shoulder girdle were complained of. Gastro-intestinal symptoms were fairly frequent, comprising nausea in 3 cases, vomiting (usually once only) in 4 cases and slight diarrhoea in 3 cases. Headache was noted in two cases. There was induration at the seat of injection in two cases. Pyrexia (to 103° F.), slight giddiness, pains in the body, general pruritus and loss of weight were noticed in one case each. These untoward effects of the injections may be tabulated thus:—

Cough and pharyngeal irritation	in 9 cases
Stiffness of neck and shoulder muscles	in 4 cases
Nausea	in 3 cases
Vomiting (slight)	in 4 cases
Diarrhoea (slight)	in 3 cases
Headache	in 2 cases
Induration	in 2 cases
Pyrexia (to 103° F)	in 1 case
Giddiness (slight)	in 1 case
Pains in the body	in 1 case
General pruritus	in 1 case
Loss of weight	in 1 case
Relapse of hæmaturia	in 1 case

The immediate beneficial results of the injections were very striking and comprised a rapid disappearance of the blood and ova from the urine, disappearance or mitigation of the hypogastric and perineal pains and pain in micturition, improvement in the anæmia, gain of weight and a quite striking improvement in the general appearance and feeling of well-being in the patients.

The remote results of these cases I am unable to discuss owing to the short time which has elapsed since the injections were given and to the fact that all the patients have left the hospital. As far as is known all the cases have remained free from symptoms except Case 9 who developed a small hæmaturia within a week of the completion of his course of injections, although no ova could be discovered on microscopic examination of his urine. Case 3 was so pleased with the results of his treatment that he writes from the country under date December 22, 1918: "The hæmorrhage has completely stopped, and bar a little pain in the affected region I am practically fit" (although he states elsewhere his duties are not of a very light character). "There are one or two fellows here who are discharged with bilharzia and have had no treatment whatever. They are naturally anxious to undergo this particular treatment. I should be greatly obliged if you could inform me as to the course they should adopt to obtain it."

That tartar emetic when injected intravenously exerts a striking beneficial effect on vesical bilharziasis is amply demonstrated by the cases here recorded, but the manner in which this effect is produced is not so evident. That the drug kills or inhibits the activity of the parasite appears to be the most reasonable suggestion. At what stage in the life history of the parasite this occurs, whether ovum, miracidium, or adult worm, or all three, has not yet been demonstrated. Christopherson claims that the tartar emetic exerts a direct helminthocidal action on the adult worm. Direct experimental proof on this point is still lacking, though Archibald and Innes's case, the only one so far submitted to post-mortem examination, provides some support for this view.

The high toxicity of tartar emetic has always been a matter of serious concern to all who have employed it in the form of intravenous injections, specially in the intensive manner which now prevails for the treatment of bilharziasis, trypanosomiasis and leishmaniasis. That such injections are not free from risk is shown by recent paper by Knowles [6], and by Archibald and Innes [7]. The former recorded five deaths out of twenty cases of kala-azar treated by tartar emetic, whilst the latter record a fatal case of bilharzia so treated. The case of Archibald and Innes was a strong Egyptian soldier suffering from hæmaturia whose urine showed a heavy infection with terminal-spined ova of bilharzia. The solution employed for intravenous injection contained one grain of the drug dissolved in two cubic centimetres of sterile water being mixed immediately before use with an equal amount of sterile normal saline solution. The initial dose was $\frac{1}{2}$ grain gradually increasing to a maximum of two grains until a total of thirty-three grains was given, the injections being given every second day. At the end of the treatment the urine contained blood, but no ova. The patient then developed influenza and died on the fourth day of the illness from broncho-pneumonia. At the autopsy no adult worms could be found though the congested mucous membrane of the bladder contained large numbers of bilharzial ova. The liver and kidney cells and the tunica intima of the inferior vena cava showed fatty degeneration and fatty infiltration, changes which were attributed to the action of tartar emetic and were not sequels of bilharzia, influenza or a previous malarial infection.

This opinion of Archibald and Innes appears to be correct as somewhat similar lesions are found in certain toxic conditions, especially in the liver in the closely allied conditions of arsenic and phosphorus poisoning and as was found by Gregorson and Taylor [8] in trinitrotoluol poisoning.

The toxicity attributed to the ova and miracidia of bilharzia by two Japanese observers, Kiyono and Murakami [9], do not appear to produce fatty changes in the liver but lead to a cirrhotic condition of that organ.

Although in Archibald and Innes' case the cause of death appears to have been influenzal broncho-pneumonia the degenerative changes in the liver and kidneys may have been recoverable, or may have been due to undue susceptibility of the patient to antimony. That very much larger doses of tartar emetic can be given intravenously with perfect safety is evident from a case under the care of Dr. C. W. Daniels and treated by Dr. H. B. Newham, C.M.G. [10], at the Seamen's Branch Hospital attached to the London School of Tropical Medicine. This was a patient infected with *Trypanosoma rhodesiense*, who received 236 bi-weekly intravenous injections of tartar emetic in the course of two and a half

years. The maximum dose was $2\frac{1}{2}$ grains and the total quantity administered amounted to the enormous total of 550 grains. The patience of the physician and the fortitude of the patient were finally rewarded by the complete recovery of the patient from the most virulent of all the forms of trypanosomiasis, and the patient happily remains free from symptoms both of the disease and of antimony poisoning until the present day.

Since the risks of antimony poisoning as the result of intravenous injections, though apparently not very great, cannot be ignored, other forms of antimony should be sought with equal therapeutic effects and a diminished toxicity. Antimony and arsenic are so closely allied in their chemical characters that this condition would probably be brought about by the productions of organic compounds of antimony. Since antimony and arsenic are very closely allied in their chemical characters and the toxicity of arsenic has been greatly reduced without diminishing its therapeutic action by introducing arsenic in organic combinations in such drugs as salvarsan and its substitutes, it would appear highly probable that similar organic compounds of antimony would be similarly influenced. In view of the prevalence of trypanosomiasis, leishmaniasis and bilharziasis in various parts of the world and the undoubted beneficial effects of antimony compounds on these diseases the production and thorough investigation of such organic compounds of antimony is one of the pressing problems of the day in Tropical Medicine.

Meanwhile Sir Leonard Rogers [11] has drawn attention to the occasional danger from the toxicity of tartar emetic intravenously and has done the pioneer work in searching for equally efficient but less toxic forms of antimony. In 1916, he recommended sodium antimony tartrate, Plimmer's salt. More recently he has employed colloid antimony sulphide intravenously in kala-azar. He found it effective in smaller doses, being retained in the blood longer than the soluble tartrates of antimony and concludes that colloid antimony sulphide appears to be a distinct advance on soluble antimony tartrates in the treatment of kala-azar and thinks it would be well worth trying in sleeping sickness. In view of the efficacy of the soluble tartrates in bilharziasis as well as of the occasional danger arising from their toxicity it is evident that colloid antimony sulphide given intravenously would be well worth trying in bilharziasis.

I am indebted to Lieutenant-Colonel Marett Tims, R.A.M.C., officer commanding the Bermondsey Military Hospital, for permission to publish these cases, and to Capt. F. Talbot, R.A.M.C., and to Drs. R. H. Townend, J. Howard Cook, A. M. Cato and A. E. Wilson for permission to use the cases under their care.

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INAGGLUTINABLE PARATYPHOID BACILLI (? PARATYPHOID C) IN INDIA.

BY LIEUTENANT-COLONEL J. A. KENNEDY.

Royal Army Medical Corps.

In my Report on the Enteric Convalescent Depot, Naini Tal, for 1914 (Indian Government Reports), I made the following note on the identification of cultures received in the laboratory during the year. "One of these was a paratyphoid but could not be classified as either 'A' or 'B' and the opinion was expressed at the time that it was *Bacillus suispestifer aetrycke*. This opinion was expressed by my predecessor in Naini Tal (Lieutenant-Colonel Grattan) into whose hands this organism came.

Again in the Report for the same laboratory for the year 1917, I made the following statement under the heading "Notes on Organisms": "Five strains are included in the above figures (one from an Indian) all isolated in blood culture, which do not conform absolutely to either 'A' or 'B.' They are definitely of a specific nature but do not give the typical serum reactions of either 'A' or 'B.' One, at least, is apparently closely allied to *B. Gaertner*. These are at present under investigation."

During 1918 I was investigating a series of these strains, hoping to make a definite statement in my Report for 1918, but in the middle of the year I was transferred to Mesopotamia and the investigation was still incomplete. Though I had tried all the likely laboratories in India I was unable to obtain a culture of *B. aetrycke*.

On arriving in Mesopotamia I found that bacteriologists were noting the occurrence of "inagglutinable" paratyphoids and I understand that quite recently Lieutenant-Colonel Ledingham, Consultant Bacteriologist, and Major Mackie, I.M.S., have come to the conclusion that certain of these should be classified as a species of paratyphosus distinct from *paratyphosus* A or B, but were unable like myself to make a complete serological scrutiny.

Finally, in the *Lancet* of February 22, 1919, Dr. Hirschfeld published a paper on "A new Germ of Paratyphoid" which he called "Paratyphoid C." It is very probable that this is the same organism as I have noted in India and as has been noted here in Mesopotamia.

The notes I have with me are incomplete and sketchy but even so I think they should be put on record so that the attention of workers in India may be drawn to the matter with a view to elucidation.

These notes deal with five strains and may be summarized as follows:—

(1) These strains were all isolated in blood culture, viz. :—

No. 1,021. from Pte. S—, 1/5 Buffs, Mhow, July, 1916.
 No. 1,172. „ Bmdr. H—, R.F.A., Lucknow, March, 1917.
 No. 1,192. „ Drvr. R—, R.F.A., Peshawar, April, 1917.
 No. 1,204. „ Pte. F—, A.S.C., Peshawar, May, 1917.
 No. 1,315. „ Cpl. O—, 1/1 Kents, Dalhousie, October, 1917.

(2) In general, their characteristics were those of the paratyphoid group, and their sugar reactions were typical (litmus milk variable, in neutral red fluorescence generally).

They were not agglutinated by high-titre *paratyphosus* A or B serum in low dilutions.

They did not absorb the agglutinins for these two organisms from specific sera.

(3) The agglutination titre of the patients' sera affords evidence of their specific nature (presumably all had been inoculated with T.A.B. with the possible exception of Drvr. R—.)

				T.	A.	B.	Own strain.
1,021	..	..	..	100	50	nil	50
1,172	..	..	..	100	100	500	2,000
1,192	..	..	..	nil	nil	nil	2,000 (not taken
1,204	..	..	..	—	trace	50	100 higher)
1,315	..	..	..	50	500	100	100

(4) They were pathogenic for rabbits. Intraperitoneal inoculation produced enlarged spleen and peritonitis and death ensued in from three to fifty days.

(5) The agglutination titres of three of the rabbits' sera were :—

				T.	A.	B.	Gaertner.	Homologous strain.
1,172	..	..	..	Trace	10	50	50	2,000 plus
1,204	..	..	..	50	nil	50	100	2,000
1,315	..	..	..	100	50	500	—	500

(6) Of the above rabbits' sera two were absorbed with *B. Gaertner* and the subsequent agglutination titre read thus :—

1,172	..	..	..	—	—	—	nil	2,000
1,204	..	..	..	nil	—	10	nil	2,000

(7) Strains 1,172, 1,192, and 1,204 respectively, absorbed all the agglutinins for strain 1,315 from 1315 serum.

Review.

THE MEDICAL AND SURGICAL ASPECTS OF AVIATION. By H. Graeme Anderson, M.B., Ch.B., F.R.C.S., London: Henry Frowde and Hodder and Stoughton. 1919. Pp. 255. 12s. 6d. net.

The writer of this volume is one of the few medical men who hold the Royal Aero Club's Aviator's Certificate. In addition to this qualification for knowledge of aeronautical matters he has also had four years' experience as medical officer at various air stations and hospitals, both at home and abroad.

The author has taken full advantage of these opportunities, and has produced a very readable book full of interest both to the medical, and to a certain extent to the general, reader.

All the various aspects of medical aviation are dealt with in interesting fashion, the section on aeroplane accidents being particularly well illustrated by means of photographs.

We feel sure that the book will be welcomed by those connected with the Air Medical Service, both in the past, and in the future.

M. W. F.

Journal
of the
Royal Army Medical Corps.

Original Communications.

EAST AFRICAN RELAPSING FEVER.

BY CAPTAIN J. K. MANSON,
Royal Army Medical Corps.

AND

CAPTAIN L. H. D. THORNTON,
Royal Army Medical Corps.

(*Continued from p. 116.*)

Relapses and Intervals.

THE question of the number of relapses occurring has been observed by us in a series of 103 specially selected untreated cases, of which sixty-six were natives of East Africa and thirty-seven natives of West Africa (Nigeria and the Gold Coast), and also in several hundred untreated cases belonging to the various African tribes, upon which observations of a more general character were made. As indicated elsewhere, the type of disease met with was in general more severe in the West African than in the East African, and the relapses consequently more numerous in the former. As many as eleven relapses were met with in one West African case, while nine relapses were several times observed in both types of natives. As a general rule the average number of relapses in all types was five. The individual immunity possessed by so many East Coast natives was well illustrated by the fact that twenty of the sixty-six East African cases showed only a single rise of temperature, no subsequent relapses occurring although no treatment was administered, while this phenomenon occurred only once in the West African series. As regards the *interval* between the pyrexial attacks, the generally accepted period of ten days would appear to be correct, though numerous variations were met with, some of which appeared to us to be capable of classification. The great

majority of East Africans held very strictly to the ten days' interval, though variations of a day one way or the other often occurred. On the other hand the West Africans tended to be very irregular, the same case showing such variation as an eleven-day interval, followed by a four-day interval,

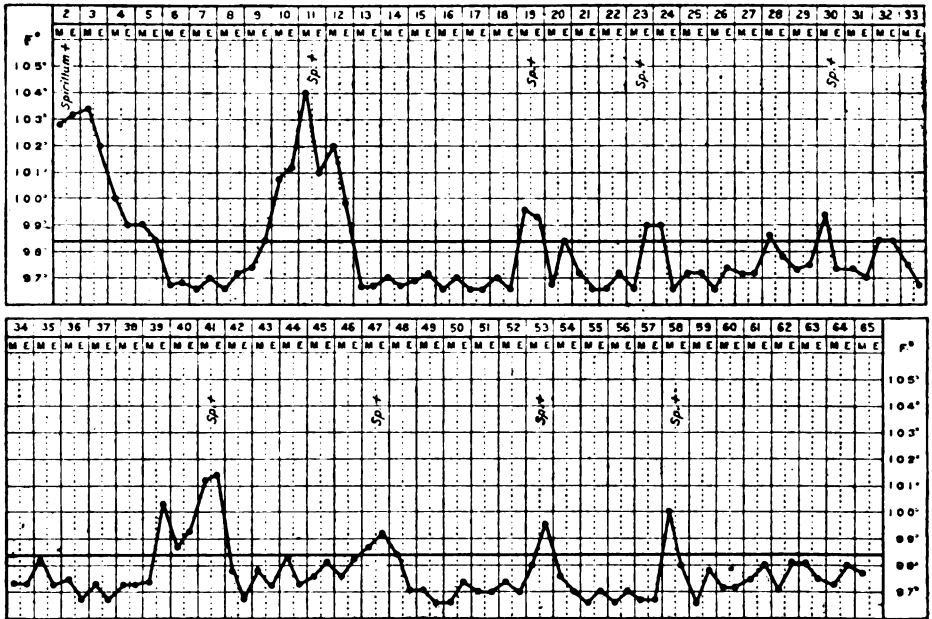


CHART VII.—Untreated case, West African. Note irregular short intervals.

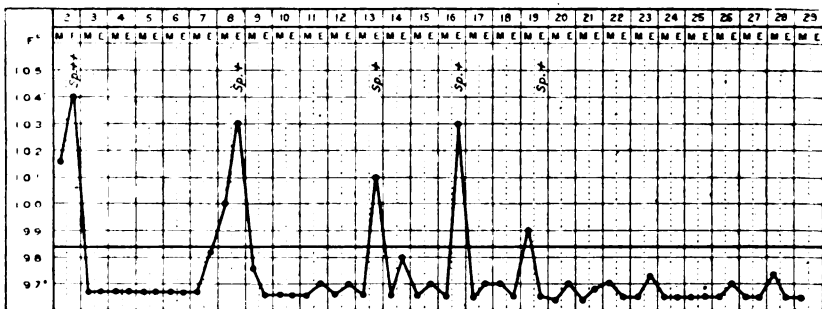


CHART VIII.—Untreated case, showing progressively lessening intervals as disease proceeds.

followed by a nine-day interval (*see* Chart VII). Certain variations of a general nature were noted in all types, for example, as the disease proceeded the intervals often, in untreated cases, became progressively shorter (*see* Chart VIII). On the other hand, treatment, especially by salvarsan

compounds administered at unsuitable times, tended to produce protracted intervals. The longest repeated interval observed by us in any of our cases was one which showed several consecutive intervals of seventeen days, while the shortest regularly occurring interval met with was six days.

Nerve Lesions.

We have noted throughout our observations that nervous lesions are extremely uncommon, as a complication in natives, and in a series of about 1,500 cases not more than one-third per cent showed any signs of nerve involvement.

Certain facts relative to the occurrence of nerve lesions in the disease have been noted, and these will be mentioned briefly before definite examples of the condition are described.

It has been our experience that all types of nerve complications occurred late in the course of the disease, seldom occurring earlier than the sixth week after the disease had been definitely diagnosed as relapsing fever. Such occasional cases as were seen while the relapses were still present occurred during the apyrexial period, and search of the blood at the time of onset of the nervous lesion failed to reveal the presence of spirilla.

Towards the end of the disease when the repeated relapses had diminished in severity and finally disappeared, and there was every appearance of a complete recovery, nerve implication seemed prone to attack the patient. It would, therefore, seem reasonable to consider the fact of nerve involvement rather as a sequel than as a complication of tick fever.

These lesions are of a transient nature, clearing up in a time proportionate to the severity of the case, and to the nature and extent of the nervous tissue involved. This would seem, therefore, to point to a toxæmia as the causative agent, rather than to some gross injury to the nervous system, due to a mechanical blocking or interference with the normal condition of the controlling centres by the organisms themselves.

The lesions manifested themselves in various forms, depending on whether the central nervous system, as a whole, was affected, or whether certain nerves were picked out singly or in groups.

Cases can be roughly classified as :—

- (1) Those showing gross central nervous lesion.
- (2) Cases showing involvement of one or more cranial and spinal nerves; though sometimes a combination of the two occurred.

Under the first group can be classed such gross lesions as aphasia, complete facial paralysis, and hemiplegia. Four of our cases have shown aphasia as an important sign of nerve involvement. The aphasia to begin with was of an extremely transient nature. In one very noticeable case in a white officer it occurred on three separate occasions, with an interval of

two to three days between each attack. It occurred suddenly and lasted only fifteen to thirty minutes at each attack. It passed off, to recur again within a day or two, this time in a rather more severe form. In this particular case facial paralysis also was present, and followed closely the third and most severe aphasic attack.

In a second case, that of a native, aphasia, facial paralysis, and hemiplegia occurred suddenly and simultaneously. This case, seen late in the afternoon, presented no special feature of note, but when the morning ward visit was made, aphasia, facial paralysis, and hemiplegia were found. A careful examination showed complete aphasia, a right facial paralysis, and a left-sided hemiplegia. The knee-jerks were grossly exaggerated, ankle clonus was markedly present and very coarse. There was loss of power on the affected side, the extremities of the hands and feet were cold, while over the area corresponding to the distribution of the infra-orbital branch of the fifth cranial nerve there was marked anæsthesia. The affected left leg and arm showed no appreciable loss of sensation, but marked loss of motor control. Twenty-four hours later very considerable improvement in the condition had taken place. The aphasia had gone, power had returned to the affected limbs, and the patient could get out of bed and walk slowly about the ward with a dragging gait. Knee-jerks, however, were still exaggerated, but the area of anæsthesia over the malar prominence was considerably diminished in size and less complete. The patient showed a totally different picture from that of the previous day, and it was only when special examination was made that any trace of the earlier lesions could be found. Uninterrupted recovery followed.

A study of cases of gross nerve lesions revealed the fact that certain more or less transient and fleeting attacks of paralysis and aphasia were present, on one or two occasions, before the really serious paralysis occurred—i.e., they ushered in the attack and were more or less of the nature of prodromal signs of coming nerve injury.

Through the courtesy of Lieutenant Brierley, R.A.M.C., of the Third African Hospital, we are enabled to give in some detail a few notes on a case of relapsing fever under his care, in which nerve lesions of a hemiplegic type were a marked feature. The patient was a young Arab, admitted on August 8, 1918, to hospital, suffering from spirillum fever. On September 7, one month after admission, it was noticed that hemiplegia of sudden onset had developed. Examination on that date showed the following condition: There was complete loss of power and movement of the right arm and leg, the plantar reflex was gone, the knee-jerk was very exaggerated, and ankle clonus very pronounced. The right side of the face was paralysed, the right eye showed an internal strabismus with drooping of the eyelid; examination of the retina and fundus showed no abnormality. Sensation of pain, pressure, and heat and cold, were all absent over the affected areas, and there was incontinence of urine and fæces. The question of a syphilitic origin for the condition was eliminated by the

Wassermann reaction, which was negative in the case of both the blood and the cerebrospinal fluid.

On September 11, two days later, examination revealed a slight return of power in the right leg, which could be slowly raised with difficulty from the bed; the bladder and sphincter reflexes had returned and control was re-established. On September 13 the leg was much better, and signs of slight recovery were evident in the arm; the face also was improved. On September 15 the leg was very much improved and the arm was rapidly recovering, while on the 20th, thirteen days after the onset of the attack, the patient was able to walk a short distance; fine and coarse movements returned simultaneously. On the 23rd the strabismus and the facial paralysis had completely disappeared; since then there has been a steady improvement and the patient seen on October 15, 1918, showed no visible signs of any previous nerve implication.

It would seem, therefore, that the cases of hemiplegia brought under our notice were all of a transient nature, and gradually cleared up, leaving no trace of any previous pathological condition.

As regards the question of special nerve involvement, paralysis of individual nerves unaccompanied by other gross nerve lesions has not been observed by us in any of our cases in natives, but we have notes of European patients in whom certain cranial nerves have been more or less singly affected. In these there was involvement, either singly or in groups, of certain of the following cranial nerves. Implication of:—

First nerve (the olfactory), whereby the sense of smell was absent, was met with in one or two cases.

Third nerve (ocular motor) along with the *fourth and sixth nerves* was frequently affected, resulting in squints, loss of accommodation and ptosis of the upper eyelid, together with a certain general loss of power of all the ocular muscles. Squints were mostly of the external variety and were not confined to any special eye, sometimes one and sometimes both eyes being involved. *Trigeminal neuralgia* was met with in one case and was of such a severity as to require special treatment by injections, while *anæsthesia* of the areas supplied by fibres from this nerve was well marked even in our native cases. Loss of taste, on the side of the tongue supplied by fibres from the nerve involved, was also noted in European cases.

Seventh Nerve.—Facial paralysis through involvement of this nerve was a very common feature, in fact it was the most constant paralytic lesion met with in the whole series of the cranial nerves. Accompanying it there was often noted secretory disturbance, usually of the nature of an excessive secretion of saliva, together with loss of taste in the anterior two-thirds of the tongue. It was usually unilateral.

Eighth Nerve.—Deafness was noted in a few cases; in some it was bilateral, while in others one ear only was involved.

As far as we are able to ascertain these conditions were more or less transient and gradually improved, though the process of recovery was

much slower and perhaps less perfect in the European than in the native, a certain slight but still appreciable weakness remaining for several months, but being followed by complete recovery at the latest within six months. We have no records of cases in which there was any involvement of the *optic, glossopharyngeal, vagus, spinal accessory* or *hypoglossal nerves*. Regarding *spinal nerves* we have been unable to obtain any record of involvement of these, though a case has been cited to us by Lieutenant-Colonel H. B. Newham, R.A.M.C., to whom we are indebted for many of these notes on nervous lesions, where loss of knee-jerks was observed in a white man who four years previously had suffered from a severe attack of relapsing fever. The evidence that this lesion was attributable to the relapsing fever appears to us to be very inconclusive, although syphilis was excluded.

The Eye.

Iritis.—As has been pointed out by many other observers, iritis and irido-cyclitis are very frequent complications met with in all classes of case, whether European or native. We have observed this condition to be present in only about three per cent of our complete series of native cases. It may occur at any period in the course of the disease, but is unusual in the later stages when the relapses have come to an end. We consider its origin to be of a toxic nature. It responds readily to treatment, either local, as by atropine and an antiseptic wash, or general, as by salvarsan. Even in the untreated cases the condition was never observed to become really serious, and complete recovery took place eventually, though sometimes only after a very protracted period. Though commonly double, one eye is usually affected much more seriously than the other.

Malaria as a Complication of Relapsing Fever.

It has been our experience in dealing with cases of relapsing fever in natives that a large percentage of these are infected with malaria, and the presence of these parasites gives rise to very great confusion in the temperature chart from time to time. The parasites lie dormant in small numbers in natives for years, and any cause lowering the health of these patients may be responsible for the parasites undergoing multiplication with manifestations of malarial attack. The influence of the presence of malaria in the blood of patients suffering from relapsing fever manifests itself in two different ways.

(A) *Irregular type* (in which the attacks of the two diseases bear no relationship to one another).

The first class of case is that where the two diseases run concurrently showing no direct influence of the one on the other, and resulting in great irregularities of the typical charts of relapsing fever. The chart, carefully studied and considered together with blood examinations from day to day, shows a more or less regularly recurring rise of temperature resulting from

the presence of spirilla in the peripheral blood, but over and above this, and superimposed upon it, as it were, there are rises in temperature identified by the blood examination as being due to presence of malarial organisms in the blood, these last rises bearing no relation to the rises due to spirilla, but occurring independently at all stages in the course of the disease. The two diseases bear no direct connexion one with the other, and the presence of spirilla in the blood does not appear to have any influence whatsoever on the malarial condition. The rise of temperature due to malaria may either occur during the spirillar pyrexial rises or during the apyrexial period when spirilla are absent from the peripheral blood. This type of case when subjected to a systematic antimalarial course of treatment responds to the remedies in so far as the malaria is concerned, but shows no alteration or influence on the subsequent progress of the relapsing fever; the same holds good if the tick fever be treated and the malaria be untreated.

(B) *The regular type* (in which malarial rises were only seen during or following immediately the spirillum relapse).

This second class of case in which tick fever is associated with malaria shows a definite inter-relationship between the two diseases. It is a very common experience to find a slight rise in temperature occurring within twenty-four hours after the spasm of fever due to spirilla has passed off and the temperature has fallen again to a normal level. This may be only a matter of one degree, and seldom rises to a greater height than 102° F., though occasionally higher temperatures are registered. If the blood is examined during this rise the parasites of malaria are found, spirilla being absent; the temperature usually quickly falls to normal and remains down till the onset of the next spirilla rise, after which the same malarial complications occur. This would appear to have some connexion between a lowered resistance to the dormant malarial parasites, due to the spirilla in the blood, whereby the former are enabled to sporulate, and so upset the temperature of the individual affected. Cases were frequently occurring in which both spirilla and malaria parasites were present together at the height of the spirillum attack. The presence of the latter may be attributed to the same lowering of the patient's resistance, as was noted in malarial attacks following spirillum rises. The spirilla attack is influenced in these cases by a tendency of the temperature often to drop at the end of the attack by lysis extending over one or two days rather than by the usual crisis. These malarial attacks were observed to occur regularly during the times of spirillum temperature and not at the apyrexial period. We have observed cases at the termination of the disease in which at the final relapse no spirilla were identified, but which demonstrated this malarial infection still showing its periodic recurrence. We have indicated in some detail the irregularities of malarial infection which have been brought about by relapsing fever, but a careful study of the converse has failed to reveal any direct influence on relapsing fever attributable to the presence

of a concurrent malarial infection. Charts X and XI are examples respectively of the irregular and regular types of malarial complication.

Prognosis.

This on the whole is very good. In giving an opinion on any case of relapsing fever certain factors have to be borne in mind, of which the

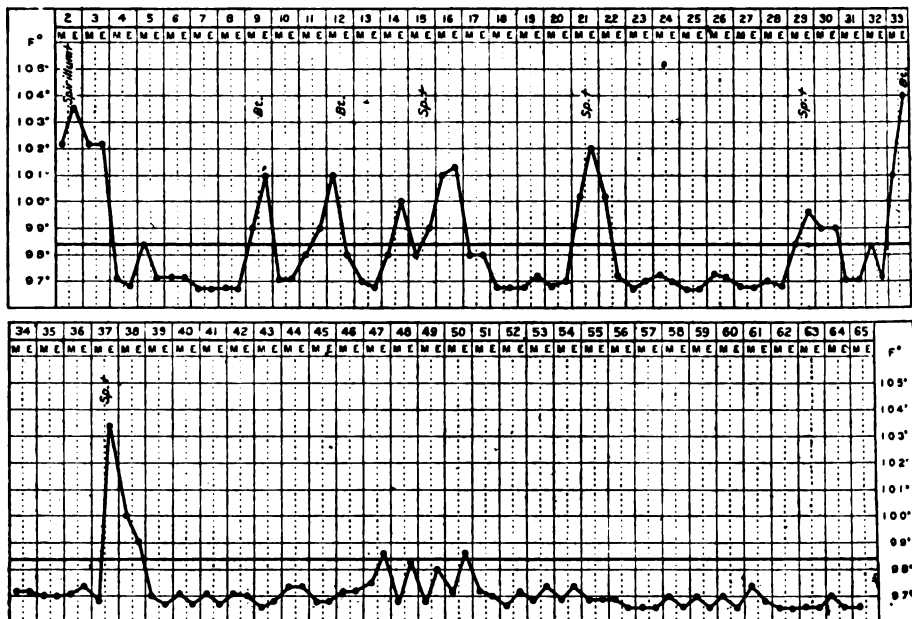


CHART X.—Untreated case, showing irregularities of temperature due to benign tertian infection.

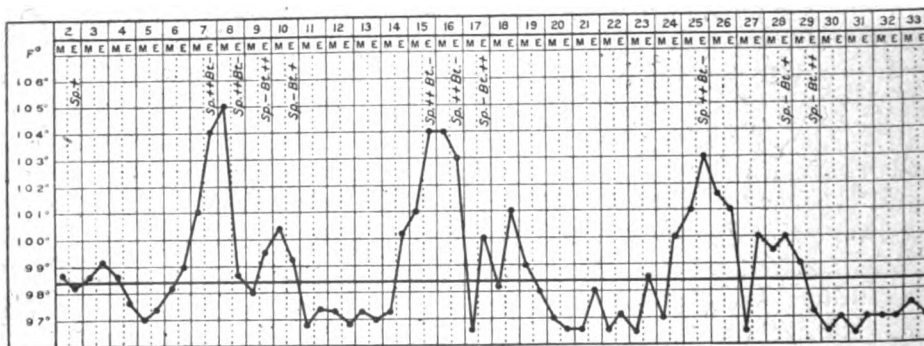


CHART XI.—Untreated case, showing benign tertian attacks following regularly after relapses due to spirilla.

most important is the racial incidence. The ordinary East African may practically always be confidently expected to make a favourable recovery, but on the other hand, especially in West Africans, the occasionally very

acute cases, and the tendency, rarely observed, to collapse or the crisis has to be borne in mind. Cases accompanied by severe bronchitis on pneumonic signs and acute jaundice must be seriously regarded. In 1,200 cases of East Africans only four cases of death attributable directly to tick fever occurred, while in some 400 cases of West Africans, sixteen fatal cases were noted. In Europeans the disease must always be regarded as serious. We are quite unable to present any figures as regards mortality in whites, but from such records as we have been able to gather we consider that it is no exaggeration to say that 50 per cent of cases showed complications either nervous or ocular. True it should be noted that a number of these cases were treated on lines other than those found most beneficial by us, and we consider that with early diagnosis and adequate treatment this high proportion of severe complication can be considerably reduced. Speaking of the disease in general, we would point out that its protracted nature under inadequate treatment renders the patient quite unfit for any active duties for a prolonged period.

Treatment.

The presence of such a large number of cases of relapsing fever, occurring as it did amongst natives who were acting as porters to the troops in East Africa, and the ensuing loss of labour, together with the necessity of hospital treatment for such sick cases, presented a serious problem to the medical authorities. Also, as has been pointed out, if left untreated the disease seems to run its course and gradually to disappear from the system, yet this only takes place after a relatively long period of time has elapsed, and meantime the patient must be considered an invalid, and ineffective for any military purpose. Hence all our efforts were directed to finding a drug which would bring about a desired effect in a minimum of time, and have no ill-effects on the health of the patient. In order to aid comparison between the actions of the various drugs employed a series of control cases was selected; these were left untreated, and the clinical picture and course of such cases were carefully contrasted with the result produced in cases treated by the various drugs employed. While considering the methods of treatment that have been advised in the past by various observers and workers on tick fever, we were struck by the large number of therapeutic agents that have been tried and recommended. It was also very evident that little or no uniformity of result had been arrived at, and all the drugs were mentioned with a certain vagueness and lack of precise opinion as to their utility.

The following were at one time or another given a thorough trial by us: *Atoxyl*, *antimony tartrate* (tartar emetic), *mercury salicylate*, *quinine*, *methylene blue*. A mixture largely used by and recommended by the Belgian Medical Authorities in the Congo consisted of:

<i>Atoxyl</i>	..	..	..	..	10 grm.
<i>Mercury perchloride</i>	..	..	..	..	0.3 "
<i>Potassium iodide</i>	..	..	..	..	2.5 "
<i>Aqua distilled</i>	..	..	..	..	to 100 c.c.

Three to four cubic centimetres were injected intramuscularly. *Salvarsan* and its numerous modifications, amongst the latter neo-salvarsan, galyol, luargol, and novarsenobillon were tested. *Salvarsinized serum* was also tried in a few cases.

In the case of many of these therapeutic agents the results were largely negative, no influence on the disease being noticed, and while the results of such a negative character are here treated in full, it is in the hope that they may be of value in so far as they may assist other investigators of relapsing fever to avoid needless waste of time, and the use of a drug which has been proved over a large number of cases to have little or no curative value in relapsing fever.

Quinine.—In view of the fact that such a high degree of malarial infection occurred in cases of relapsing fever we had ample facilities for observing the effect of the administration of this drug on the course of the disease, both in cases complicated by malaria and in uncomplicated cases. Quinine was given by the mouth twice daily in ten-grain doses in one set of cases; with a view to bringing the drug into direct contact with the causative organisms, ten grains of quinine were given intravenously twice weekly irrespective of the presence or absence of fever to a second series of cases, while a third group had a similar injection given only when the temperature was rising for a spirillum attack or relapse. No effect on the course or any modification of the severity of the disease was observed, while the number of relapses was in no way decreased, and the patient, apart from benefiting in degree by the antimalarial treatment, did not appear to derive any good from the quinine administration. Our experience shows that quinine is entirely without therapeutic effect in the treatment of relapsing fever.

Methylene Blue.—This drug was administered in one-grain doses in pill form once daily over a course of twenty-one days; no action of a beneficial nature was observed and cases given this remedy continued to relapse as if no drug had been administered. Methylene blue given by the mouth in our opinion has no action on relapsing fever.

Mercury.—Mercury in the form of mercury salicylate has been stated to have given satisfactory results in the hands of various Belgian investigators in the Congo in cases of tick fever. It is also reputed to have been a famous German remedy. With this in view, a thorough trial of this remedy was given over a large number of cases. The drug in ten per cent form suspended in olive oil or liquid paraffin was injected in one cubic centimetre doses intramuscularly; the site usually chosen was the buttock, care being taken to avoid the region of the sciatic nerve. In the course of the trial of this drug there was brought home to us very forcibly the fact that the African native is very intolerant to mercury. He appears to tolerate a certain amount only, and whenever this is exceeded marked symptoms and signs of mercurial poisoning were observed. The degree of toleration is low and idiosyncrasy of the individual patient played a

considerable part, but it was observed that few cases could be found able to stand more than one cubic centimetre Hg. Sal. injected once weekly—i.e., one grain and a half. Mercury poisoning, or ptyalism, is manifested by the onset of pain in the gums, which become swollen, red and spongy, the salivary glands become enlarged and tender and the increase in their secretion is very marked, causing the patient to drip saliva from the mouth. Mastication is difficult and very painful. The tongue is swollen, the breath foul, the teeth tender to touch, and if the condition is untended and the exciting cause not withdrawn it might pass on to actual ulceration of the mucosa and the loss of a number of teeth. It was found that even when the drug was withdrawn and suitable treatment instituted, the condition tended to be persistent, and we have noticed patients salivating even after several weeks had elapsed. It was evident, therefore, that mercury if it was used in the treatment of relapsing fever or any disease in the African native, had to be used with great care, and a sharp look-out kept for any evidence of commencing mercurial poisoning. The great majority of our cases treated by this method (one cubic centimetre of ten per cent suspension intramuscularly once per week) showed a notably aberrant form of temperature chart in which the regular rises were interspaced by a series of irregular lesser rises. These were of a swinging type and are attributed by us to the general septic condition to which the patient was reduced by our inexperience of his intolerance to ordinary doses of mercury. Much smaller doses of mercury did not produce this condition. But we would point out that even the larger doses failed to shorten the course of disease or modify the clinical picture of the relapses. We would wish to mention here, however, that, basing our opinion on observation made in the treatment of syphilis and yaws in natives, we consider mercury salicylate to be an extremely valuable preparation, and the results obtained with it in those diseases were superior to those given by other salts of mercury.

Antimony Tartrate.—This drug has been highly recommended on account of its powerful action in trypanosomiasis, and certain workers have mentioned varying results in its efficacy in the treatment of relapsing fever. With this in view a series of some sixty cases were systematically subjected to the drug and its effects noted. It may be of interest to mention at this point that, in our experience, the native stands antimony well, even when injected intravenously and in large doses. Beyond a certain feeling of nausea, constriction, and tightness about the upper part of the chest, and slight cough, occasionally seen, little or no reaction to the drug was observed. These slightly disturbing symptoms quickly passed off, often not lasting longer than fifteen minutes, and certainly not more than half an hour after the injection had been given. Our cases were subjected to antimony given in doses, to begin with, of one grain of the drug in two ounces of normal saline twice weekly by intravenous injection. By gradually increasing the dose, the patient, after a few weeks, was taking

the drug in bi-weekly doses of three grains each (six grains in all). This administration was made irrespective of the presence or absence of temperature due to spirilla relapses. A second series of cases was given intravenous injections of antimony in doses graduated from one to three grains, but differed from the first set in the doses being given only when the temperature was rising for a spirilla attack or relapse. In none of our cases was any effect noticed, either in cutting short the course of the disease or in reducing its severity. This was very well demonstrated to

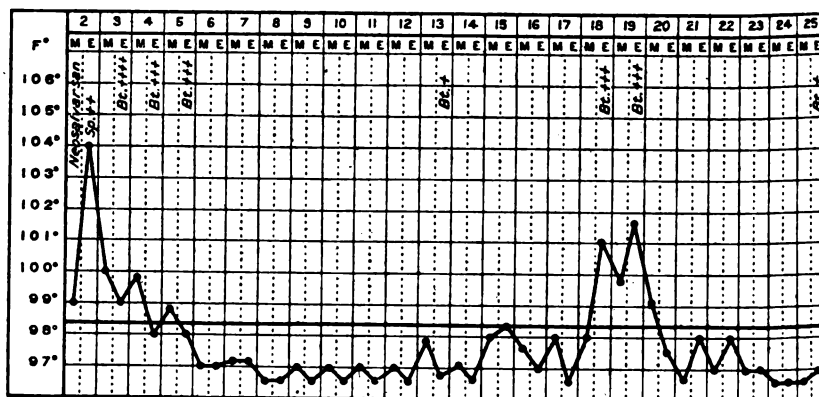


CHART XII.—Shows effect of treatment of first attack by neosalvarsan. Note failure of latter to eradicate pre-existing benign tertian infection.

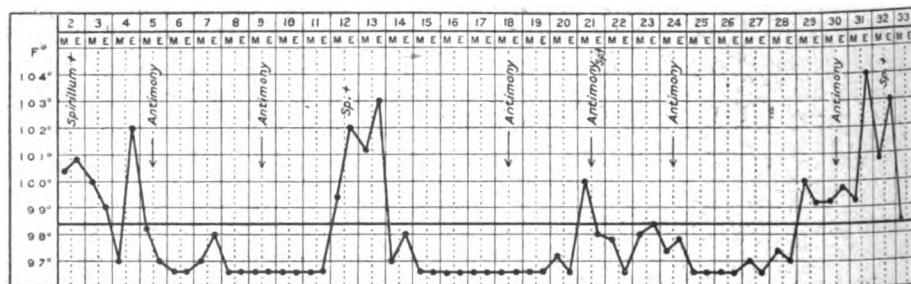


CHART XIII.—Treatment tartar emetic intravenously; dose two grains on each occasion.

us by one case which more or less accidentally proved the inefficiency of antimony in the treatment of relapsing fever. A case of trypanosomiasis, under our care, had been treated with excellent results by large intravenous bi-weekly injections (five grains per week) of antimony tartrate. In the course of this disease he developed relapsing fever. This it must be remembered took place in a patient who was having maximum doses of antimony and whose system must be considered to have been saturated with the drug. The antimony dosage was continued with a view to

controlling the trypanosomiasis rather than to treating the relapsing fever. The case continued to relapse, and its course, viewed from the point of tick fever, was in no way modified. It appears to us that this case is a striking example of the inefficiency of antimony as a curative drug in the treatment of relapsing fever. Chart XIII shows a case treated by intravenous antimony injections.

Atoxyl.—This drug has been largely recommended by many observers as a potent method of treating relapsing fever. A series of our cases were therefore submitted to its action over a period of several months. It was given in two ways: (1) intramuscularly in three-grain doses, (2) intravenously in doses varying from one to three grains. In both sets of cases the time of administration varied, one set getting injections intramuscularly or intravenously twice weekly, while in the second series the administration only took place on the rise of temperature due to the presence of spirilla in the peripheral blood. A careful watch was kept for early evidence of toxic action through overdosing or idiosyncrasy on the part of the patient, but in none of our cases were such symptoms observed. From the observations made on these cases we are of opinion that atoxyl does have a beneficial action on relapsing fever, but this is of such a feeble and uncertain character as to make the use of the drug as a routine treatment undesirable; moreover its potent toxic action and the risk of optic atrophy, and the necessarily small doses in which it has to be given, detract much from its efficiency as a curative agent. In the vast majority of our cases no diminution in the number of relapses took place, though in a few milder cases there was evidence that these were not so frequent; but there was an appreciable diminution in the severity of the relapses, the temperature in these not rising so high as in untreated cases. On account therefore of the feebleness and uncertainty of its action, and its possible toxic effects, and of the smallness of the dose which over a prolonged period can be safely administered, atoxyl must be regarded as of little value by itself in the treatment of relapsing fever.

The Belgian Mixture.—This preparation did not in our hands give very striking results. Its action appeared to be very similar to that of atoxyl when given alone. A certain degree of benefit resulted from treatment, but this was slow and feeble, and had all the disadvantages of requiring to be kept up over a relatively long and indefinite period.

Salvarsan Compounds.—It has been well known for several years that salvarsan has a very powerful and beneficial action in cases of relapsing fever, though there was little uniformity in the method of its administration; the results put forward, though in the main satisfactory, were more a matter of personal opinion based on a few cases, than the result of a systematic investigation of its action. With a view to finding the best form of salvarsan compound and the time of administration giving the maximum result, a large number of cases, several hundred in all, were treated by neo-salvarsan, galyol, luargol, novarsenobillon. These compounds

were given at various stages in the course of the disease, and it was noted that there were marked differences in the effects produced by the same agent when administered at different periods of the disease. The same differences were also noted in relation to the stage of the attack at which administration took place. Salvarsan and its substitutes were given in three sets of cases:—

(1) *On the rise*, i.e., when temperature was rising in a spirillum attack.

(2) *On the fall*, i.e., when the temperature was falling after a spirillum attack or relapse.

(3) *In the apyrexial period*, i.e., when the temperature was normal.

The results of such experimental treatment were noted over a period of about six weeks during which the patient was kept under observation. In regard to the set of cases where salvarsan was given in the apyrexial period it was noted that, while the case seemed to benefit by such treatment, yet after a varying period relapses were sure to appear, though often much modified in severity, and microscopical examination revealed the presence of spirilla in the blood during these rises of temperature. The apyrexial interval during which the drug was administered was in all cases markedly lengthened, and in several mild cases it was only after several weeks that spirilla re-appeared in the blood. The set of cases where the remedy was given as the temperature was falling to normal, showed distinct improvement. Relapses were less frequent, less severe, and the intervening interval was very much protracted. In those cases where the drug was given as the temperature was rising, the best results were obtained. Relapses were very uncommon; in only about fifteen per cent of our cases did they occur, and a second dose administered again as a rise took place, in all but one case, completed the cure. The one exception to this was a very debilitated West African, to whom two doses of galyl were given on two consecutive rises of temperature. After a very protracted interval a relapse occurred, and a third dose was promptly administered with complete curative effect. The case was observed for several months and at no time was any trace of a recurrence due to spirilla observed.

From the above series of cases our observations would lead us to believe that the maximum effect of salvarsan is obtained when the temperature is rising.

The question as to the varying potency of salvarsan and its substitutes when administered on the various rises of temperature was also considered. The drug was given to some thirty cases during the initial paroxysm of temperature, that is, when the temperature was raised at the first attack. The results were compared with those obtained in cases where administration took place on the later relapses. Our results unanimously show that the maximum effect was obtained when the drug was given on the first attack. In every case a complete cure was effected by one injection.

Cases of even heavy infection did not again relapse though kept under observation for many weeks. The longer the disease had been in progress when the drug was administered the less marked was the effect produced and the benefit resulting. Regarding the form of salvarsan used, we obtained best results with novarsenobillon; neo-salvarsan, luargol, galyl and salvarsan being placed in descending order of merit as named. Since, however, we always administered the dose of each preparation recommended by the manufacturer (*see* Appendix) it appears probable that such differences in potency of the various compounds as we observed are attributable more to differences of dosage than to any specificity of action. For example, 0.9 gramme of novarsenobillon was always given, while the dose employed of galyl was only 0.35 gramme. Of the former, one injection only was generally required; if the case relapsed, a second dose was indicated, and in the vast majority of our cases this produced the desired effect of preventing further relapses and clearing spirilla from the blood.

We have observed that the native stands the administration of salvarsan or its substitutes well. We have given these in several hundred cases, and we have had no trouble from collapse or vomiting following on the injection. The native does not seem to be subject to the more serious symptoms following administration often observed in Europeans. In only two of our salvarsan series did death occur, and in both of these the drug was given when the patient was desperately ill, and little hope could be held out for his recovery. We are of opinion that with ordinary aseptic care in administration the salvarsan series of drugs can be given to the native without any apprehension of danger.

The results of our findings in regard to treatment may be summed up briefly as follows:—

- (1) Give salvarsan or one of its substitutes.
- (2) Of these, novarsenobillon 0.9 gramme gave most satisfactory results in our hands.
- (3) Give it on the first attack of fever, and failing this, wait till the first relapse, and give it then on rise of temperature.
- (4) Administer it always on the rise of temperature, and never in the apyrexial period.
- (5) Should a further relapse occur, repeat the dose as before on the rise of temperature.

If such a course is followed we are of opinion that we have means at our disposal whereby any attack of relapsing fever in the African native can be cured. Notes on these salvarsan compounds and their dosage will be found in Appendix. *Salvarsanized serum* was tried on a series of ten cases in doses of from eight to fifteen cubic centimetres, but failed to yield any satisfactory result. Charts XIV, XV, XVI, XVII, XVIII, XIX, show the results of administration of salvarsan compounds at various periods of the disease.

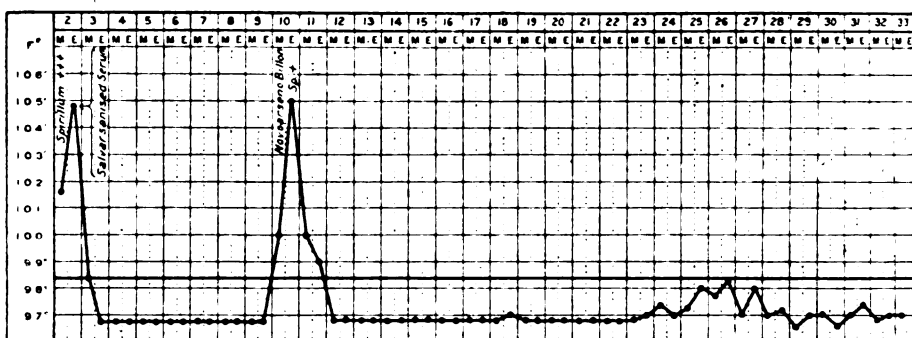


CHART XIV.—Treatment salvarsanized serum (see note); note failure, but success of novarsenobillon on subsequent relapse.

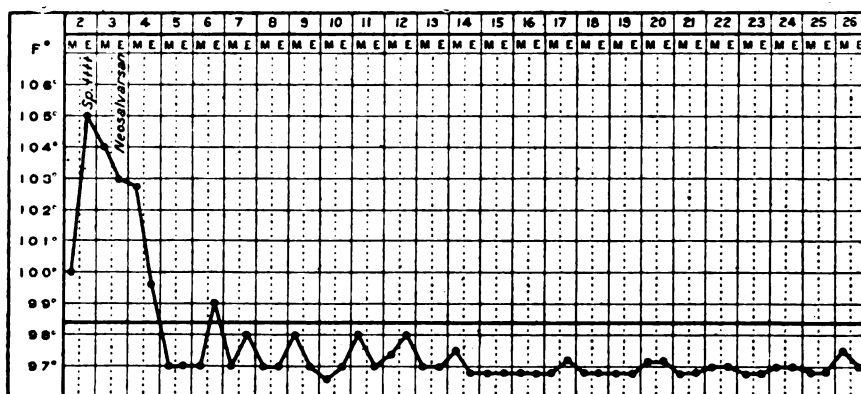


CHART XV.—Shows effect of treatment of first attack by neosalvarsan.

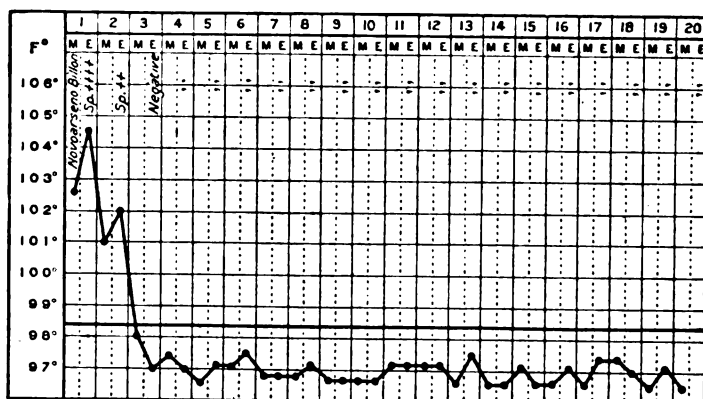


CHART XVI.—First attack treated with novarsenobillon; no relapses occurred. Note daily blood examinations, all negative.

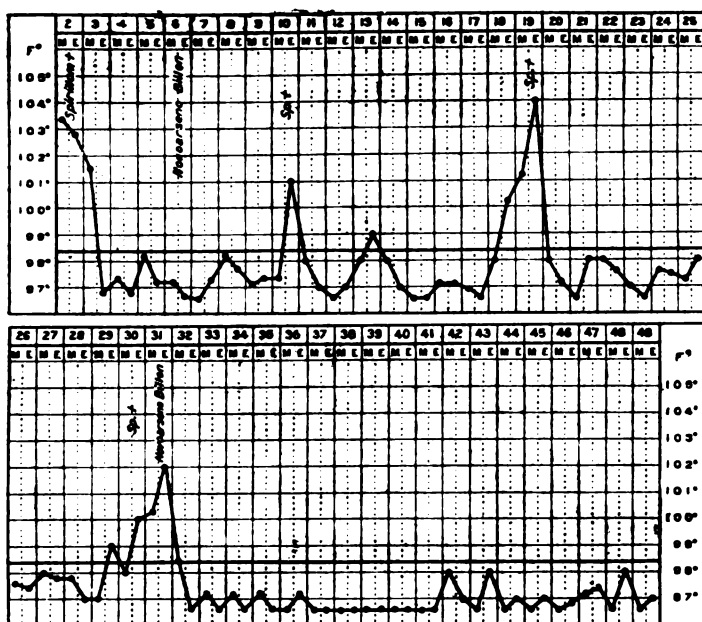


CHART XVII.—Treatment novarsenobillon in first apyrexial period. Note recurrence, also success of further novarsenobillon given at subsequent relapse.

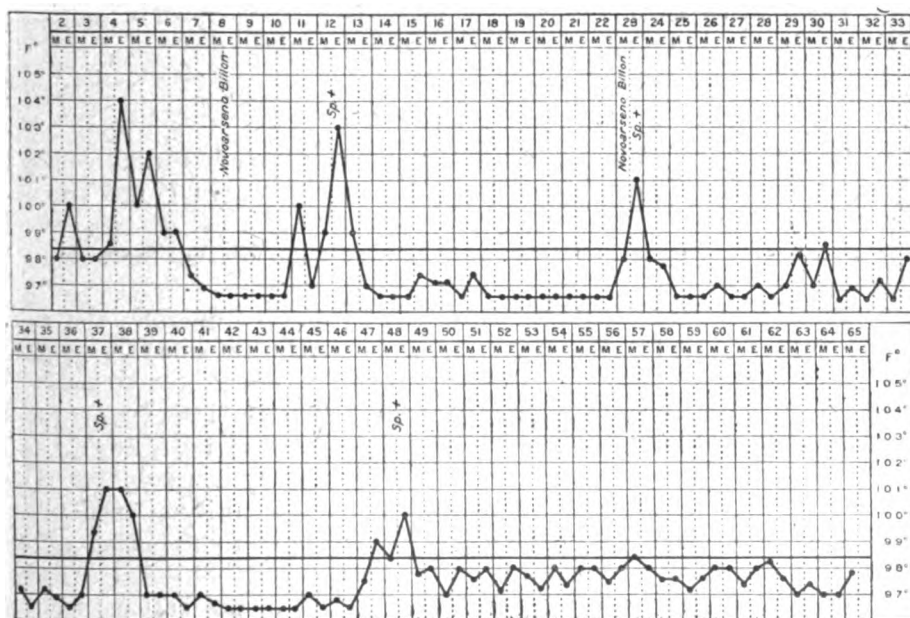


CHART XVIII.—Treatment novarsenobillon in first apyrexial period. Note failure, also failure of further novarsenobillon given at subsequent relapse.

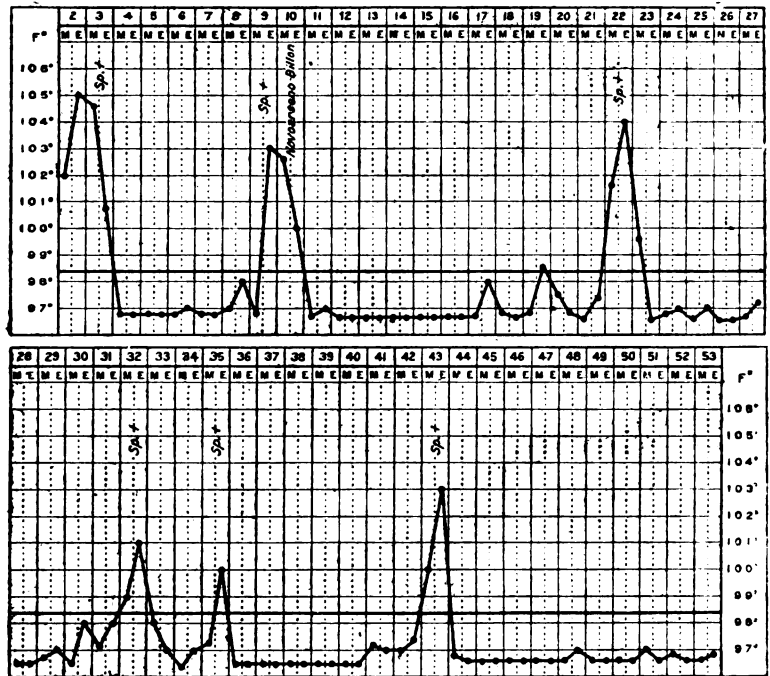


CHART XIX.—Treatment novarsenobillon 0.9 gramme at second spasm of temperature
Note recurrences.

PROPHYLAXIS.

There are certain prophylactic measures which, if carefully observed, may be confidently expected to very greatly reduce, if not put an end to, the incidence of the disease. These measures fall into two groups, according as to whether they are designed for the protection of the European or the native.

First as regards the European. In permanent quarters the risk of infection was found in East Africa to be practically *nil*, since the possibility of *O. moubata* gaining access to such quarters undetected was extremely small. It must be borne in mind that this tick is an extremely slow feeder, so much so that, especially taking into consideration its nocturnal habits and antipathy to light, infection during the waking hours seldom, if ever, occurs. Notwithstanding this almost complete security in fixed quarters, however, there is a very real risk of the European acquiring infection when on safari (=trek), and it is during these times that the great majority of cases in whites occur. Among the measures of precaution which may be taken by the individual to avoid infection we consider the following to be the most important :—

(1) The absolute avoidance of native houses, especially at night; a very great proportion of these along frequented routes of travel contain ticks.

(2) The avoidance of ground for a camp site which has in the past been used by natives for camping purposes; inspection of such ground during the daytime will probably not reveal ticks, but there is a great probability of these making their appearance during the night. It must not be forgotten that ticks are able to remain without food for years, so that a site which has not been used by man for a considerable period must still be regarded as potentially infected.

(3) Should it be necessary to sleep on such ground, a well-tucked-in mosquito net is of great value; the very great majority of ticks are too large to pass through a net, and they may often be observed at night under such conditions crawling over the outside of the net seeking access within. The presence of a lamp by the bedside will assist in keeping off ticks.

(4) On safari in districts known to be heavily tick infested, a careful inspection of one's blankets, etc., before one's bed is prepared is advisable, as ticks are very liable to be picked up in porters' loads during rests on the march, and crawl into the folds of blankets in search of darkness until night comes. In short, the personal prophylaxis reduces itself almost entirely to making one's sleeping place tick proof, and provided the above measures are carefully carried out the risk of infection may be regarded as infinitesimal.

The much greater problem of the prevention of the disease among natives was a source of very considerable difficulty to us in Dar-es-Salaam. The African native, although he well knows the disease is acquired from ticks and is able at once to identify the latter, very seldom shows any objection to sleeping in tick-infested quarters, and it is only after cases begin to occur that one's suspicions of possible infection of the quarters are aroused.

The quarters inhabited by the porters in Dar-es-Salaam under supervision of the Military Labour Corps consisted, for some time previous to our investigation, of huts some thirty yards long and four yards wide, the roof and sides made of plaited palm leaves supported by some thirty wooden poles to each hut, or "banda." The floors consisted of red sand, beaten hard. Most of the native camps in the Dar-es-Salaam area were either situated on old tick-infested ground, or had suffered from recent heavy importation of ticks during the campaign. Search of such quarters showed that the ticks were present during the daytime in the loose sand in spots where the floors had worn, and especially around the supporting poles, where the action of the wind had loosened the sand around these poles; ticks were never met with at a depth in the sand greater than six inches. Since the African native under active service conditions eschews the luxury of a bed, and sleeps on the floor, it will readily be seen that the probabilities of infection were considerable. The problem of combating this state of affairs appeared to us to be a double one:

firstly, since it was found to be impracticable to remove the camp to new and uninfected ground, to devise some method whereby the ticks already present would be either killed or prevented from coming to the surface; and, secondly, to prevent any further importation of fresh ticks. As regards the former, the first measures tried consisted of building hard red sand floors, accompanied by spraying of the floors by various solutions likely to be lethal to the tick; the red sand floors, however, proved to be very unsatisfactory, as they so quickly showed soft patches after a little wear, and it was found to be impossible to obtain a permanent hard packing of sand around the poles. Among the solutions used for spraying were crude creosol 1 in 100; sodium arsenite about 1 in 300; and crude oil as used for oiling stagnant water in antimalarial work; none of these solutions appeared to give any permanently satisfactory result, and they were abandoned. It must be borne in mind that the employment of such a poisonous substance as arsenic would appear to be inexpedient under such circumstances, in view of the risk of absorption, the danger being accentuated in this case by the native custom of eating off the ground.

The provision of a thoroughly hard floor impermeable to the tick appeared to us to be a first essential; the provision of concrete for such a very large number of floors as required treatment being impracticable in Dar-es-Salaam, it became necessary to find some local substitute; this was supplied by *ant-heap earth*, of which a large quantity was present in the locality; it was beaten hard on the floors to a depth of at least four inches, and allowed to set; afterwards a top dressing of *cow dung* was smeared over the whole surface to a depth of half an inch in a liquid condition; afterwards, the surface was treated once weekly with a watery solution of cow dung to maintain it in good order. The following experiment, several times repeated, showed the efficacy of cow dung: Three tins were taken, the first containing pure liquid cow dung, the second twenty-five per cent cow dung in ant-heap, and the third only moistened ant-heap; some thirty to forty ticks were mixed with the contents of each tin, and the tins were stood in a large tray of pure creosol and left for twenty-four hours. Examination of the contents at the end of this time showed that the ticks in the pure cow dung were still present alive, the slimy consistence of the dung having prevented their climbing out; those in the pure ant-heap were also present and showed no antipathy to their surroundings; but those in the twenty-five per cent dung had all without exception crawled out of the tin and immersed themselves in the creosol in an endeavour to escape; this very marked antipathy of the tick to cow dung appeared to us to be worthy of incorporation in our measures for the prevention of the disease. Accordingly, all floors in the area were laid down in the method described (ant heap and cow dung) and the results obtained were found to be highly satisfactory. Such floors give a hard even surface, and permit of being very cleanly brushed out every day; they also wear well, do not smell, and their provision is in our opinion one of the most important factors in the prevention of the disease.

It was feared that, being driven from the floors, the ticks would betake themselves to the roofs, as has been noted in Uganda, but fortunately this did not appear to be the case, repeated search of many roofs failing to reveal any ticks; even should a few ticks take up such a position, we do not consider it to matter very greatly, since they are very unlikely to lay eggs there. The question of eggs is of great importance, since ticks infected with *S. duttoni* are infective through several generations.

Other measures taken consisted in the offer of a reward of one cent for every ornithodoros tick brought in; this was offered at the suggestion of Major Scott, D.D.M.L., and the degree of infestation in Dar-es-Salaam may be judged by the fact that over 30,000 ticks were brought in from a single camp in one month. This procedure we consider to be of very considerable value.

Further, every banda in the area was provided with a specific number; this number was shown on the native's sick report if sent to hospital, and we were thus able, within a few moments of microscopic verification of the diagnosis, to place our finger on the infected banda, and advise the removal of the remaining inmates until such time as the ticks were destroyed.

The last measure was a routine inspection of the blankets and kit of all new-comers on admission to a camp in the area, and also a weekly inspection of all blankets in the camp, for ticks. We have found by experience that blankets are the commonest means whereby ticks are carried from place to place by natives.

We would wish here to state our indebtedness to Lieutenant Forgan, M.L.C., who in addition to affording us every facility in our investigations at the Carrier Depot, Dar-es-Salaam, has carried out our prophylactic recommendations in a most effective manner.

It was found that by strict enforcement of these simple measures the incidence of relapsing fever could be very markedly reduced; the Carrier Depot, Dar-es-Salaam, a camp which had shown a steady rate of one case per hundred porters per week for some time, showed a drop to only one case per thousand weekly, after the measures had been in operation for one month, and in several smaller camps the disease disappeared altogether. Chart XX shows the effect of these measures in the invalid camp, Dar-es-Salaam. A certain number of cases are, in our opinion, unavoidable, since the exigencies of the campaign make necessary the sudden importation of perhaps several thousand very unclean natives direct into a camp before their kit or their persons can be at all thoroughly examined, and it is only by a strict adherence to the principles laid down that these occasional infections of a camp can be prevented from giving rise to an epidemic of considerable dimensions, which, once started, is a very difficult condition of affairs effectively to overcome.

Before bringing these notes to a close, we should like to express our indebtedness to a number of individuals, and our gratitude for their assistance. First, to Lieutenant-Colonel H. B. Newham, R.A.M.C.,

Consultant in Tropical Medicine to the East African Forces, for sound advice, encouragement, and for his kindness in procuring for us various reagents, both for the clinical and laboratory work on innumerable occasions; to Lieutenant-Colonel C. P. Bligh Wall, S.A.M.C., A.D.M.S. (M.L.), and to Lieutenant-Colonel W. H. Elliott, R.A.M.C., O.C. Carrier Depot Hospital, Dar-es-Salaam, both of whom have afforded us every facility and encouragement in our investigations, and without whose hearty co-operation over a long period this work could not have been carried out; to 23886 Pte. M. Timney, R.A.M.C., for much hard work in the clinical supervision of our patients in the wards; and to 67366 Pte. J. Tomlinson, R.A.M.C., for compiling the charts which accompany this publication; finally, to Serjt. Paulo Musoke, A.N.M.C., for much arduous and skilled assistance in the laboratory.

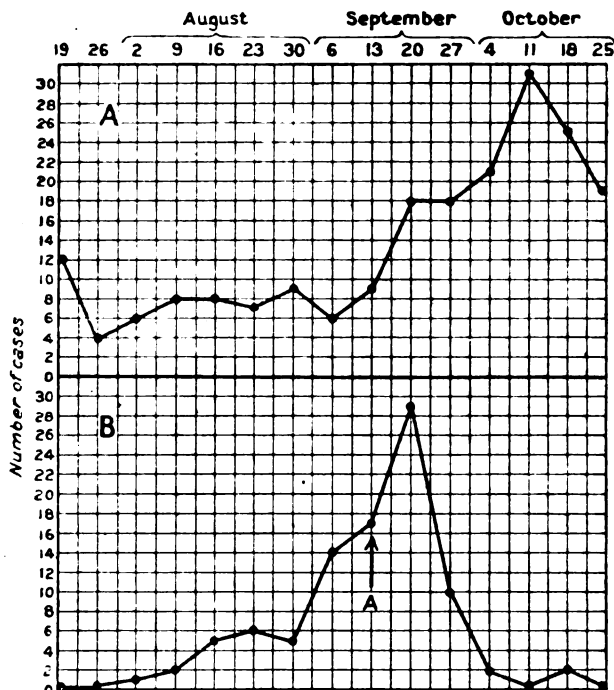


CHART XX.—Showing effect of hard floors on incidence of disease. Chart A shows number of cases occurring weekly in a camp in which hard floors had not been laid down. Chart B shows number of cases in same period in a neighbouring camp; hard floors were laid down at arrow A. Note subsequent drop in number of cases.

APPENDIX.

(1) The method of blood examination performed in the Carrier Depot Hospital, Dar-es-Salaam, is given below. Thick films only were used as a routine, their inestimable advantage over the thin film method for diagnostic

purposes enabling as many as 150 slides to be examined in a day by a single observer. The stain used was Azur II—Eosin, which stains malarial parasites, spirilla, filaria, and trypanosomes equally well for diagnostic purposes.

Method.—A fair sized drop of blood is taken on the slide and spread to about the size of a shilling. It is allowed to dry for at least one hour before staining, and must be carefully protected from dust during this time. Stain with the following mixture, seeing that the whole slide is covered with stain :—

Solution 1.—Azur II 1/1,000 in neutral distilled water.

Solution 2.—Eosin 1/16 666. This latter is best kept as a stock one per cent solution, of which three cubic centimetres are added to five hundred cubic centimetres neutral distilled water. For use, mix one cubic centimetre Solution 1 with nine cubic centimetres Solution 2. This final mixture should be made up fresh daily.

This watery stain both dehaemoglobinizes and stains the film at the same time, all that remains being the stained leucocytes and any parasites that may be present lying free in the homogeneous debris of the red corpuscles. After staining for thirty minutes, flood the stain off rapidly with distilled water, and allow it to dry protected from dust. Note: It is highly important that the distilled water in the above be strictly neutral; to determine this we always employed Tribondeau's hæmatoxylin test—two drops of a saturated alcoholic solution of hæmatoxylin in a test tube half filled with water to be tested; in neutral water, the purple colour of the hæmatoxylin will develop in between two and four minutes; should the water be alkaline, colour is seen right away; if acid, it is delayed. The addition of one per cent acid or alkali is then made until on further testing the colour appears in the prescribed time.

(2) The examination of *O. moubata* for *S. duttoni* was performed by grasping the insect firmly in a pair of forceps and pulling off one leg close to the body; after waiting some thirty seconds a small drop of serum exudes from the stump; this is placed on a slide, stained and examined.

(3) The following is the dosage and methods of administration of the various compounds used in the treatment of relapsing fever.

(a) *Antimony Tartrate.*—One grain to two grains in two ounces of normal saline.

(b) *Atoxyl.*—One grain to three grains in one ounce of normal saline.

All of these were given by means of a large ten cubic centimetre glass syringe, the needle being kept in position in the vein and the syringe withdrawn and filled as often as was required. Injection at all times was made very slowly.

(c) *Mercury salicylate and the Belgian preparation* were both given by means of a hypodermic syringe into the buttock.

(d) *Novarsenobillon*, 0.9 gramme; *galyl*, 0.35 gramme; *luargol*, 0.3 gramme; *neo-salvarsan*, 0.6 gramme.

All the above preparations were given in concentrated form in ten cubic centimetres distilled water, administered with a ten cubic centimetre syringe. It is important to note that the solution must be kept at body temperature and injected at this heat, otherwise rigors are sure to follow its injection.

(4) The following abbreviations are made use of in the charts given: Sp., spirilla; B.T., *Plasmodium vivax* of benign tertian fever. The number of plus signs following these abbreviations indicates the approximate degree of infection, extremely scanty infections being designated by one plus (+), and progressing up to five plusses (+++++) in the case of the very heaviest infections.

I.—A REPORT FOR THE PATHOLOGICAL COMMITTEE OF THE WAR OFFICE OF AN INQUIRY INTO GINGIVITIS AND VINCENT'S DISEASE OCCURRING IN THE ARMY.

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Royal Army Medical Corps.

CAPTAIN CECIL PRICE-JONES,
Royal Army Medical Corps.

AND

MISS L. DIGBY.

I.—INTRODUCTION.

THE prevalence of acute ulcerative gingivitis and Vincent's angina in various units of the Army both at home and at the front, threatened to be, at one time, a serious disability among the forces. The subject, however, received the earliest attention from the Army medical authorities, and never became of urgent importance.

At the suggestion of the Director-General, A.M.S., and the Pathological Committee of the War Office, it was thought desirable to inquire into the etiology, prevalence and prevention of gingivitis and Vincent's disease.

This inquiry was commenced in July, 1918, and terminated in April, 1919. The work was carried out by Lieutenant-Colonel Sir David Semple, R.A.M.C., Captain Cecil Price-Jones, R.A.M.C., and Miss L. Digby.

Laboratory accommodation was provided at the Royal Army Medical College, London, but owing to the amount of laboratory war work which had necessarily to be carried out at that institution, the accommodation and facilities at our disposal were unavoidably limited.

The commencement of the work was concerned with the following questions :—

(1) What is the prevalence of gingivitis in military hospitals in England and in military patients returning from the front? What is the relation of this prevalence among those who had been to the front and those who had not been to the front?

(2) What is the condition of the teeth in these men?

(3) To what extent does gingivitis come under the notice of Army dentists in the routine course of their duty with the troops?

(4) With what frequency do fusiform bacilli and spirochætes occur in apparently healthy mouths of hospital patients suffering from wounds and other diseases, and in the mouths of those (including recruits) who had not been to the front?

(5) What are the morphological and cultural characters of the *Bacillus fusiformis*?

(6) What varieties of spirochætes are found in the mouth associated

with *Bacillus fusiformis* in healthy and diseased conditions? What are their morphological and cultural characteristics?

The time limit to the investigation did not admit of animal experiments to determine the relationship of fusiform bacilli and spirochætes to gingivitis (acute ulcerative, subacute and chronic) and "Vincent's disease," or the relations of gingivitis to pyorrhœa alveolaris.

Fusiform bacilli and spirochætes found so abundantly (often almost in pure cultures) in ulcerative gingivitis, Vincent's angina, and other morbid conditions of the mouth ("Vincent's disease"), are generally regarded as causal organisms, and very likely this may be right; the recorded experiments on animals with these organisms have invariably given negative results.

The evidence of the presence of *Bacillus fusiformis* immune bodies in the blood serum of those who have recovered from attacks of Vincent's angina, and in those who have fusiform bacilli in their mouths (given further on in this report) suggests that *Bacillus fusiformis* is one of the causal organisms. The subject requires further investigation.

Information is also wanted on the relation of gingivitis to pyorrhœa alveolaris. Does gingivitis always precede pyorrhœa alveolaris, and are fusiform bacilli and spirochætes the cause of both conditions? [27] Both these organisms are universally present in the mouth.

In addition to gingivitis and Vincent's angina, there are several other mouth and throat conditions in which fusiform bacilli are found, e.g., cancrum oris, noma and other ulcerated conditions of the mouth and tongue, pyorrhœa alveolaris, carious teeth, and in fewer numbers in the mouth of persons free from these diseases.

Fusiform bacilli have been found in discharges from the ears, intestinal lesions, appendicitis, pyothorax, gangrenous laryngitis, fœtid bronchitis, abscess of the kidney and in many other diseased conditions.

In 1913 Larson and Barron [14] isolated *B. fusiformis* from the blood-stream of a patient suffering from an obscure form of fever which lasted for several weeks, and which ran a septic temperature. The patient was suffering at the same time from severe pyorrhœa alveolaris, and a septic condition of the fauces and antrum of Highmore. The culture was obtained from the blood-stream a few days before his death, and the organism isolated was culturally and morphologically identical with the *B. fusiformis* described by other authors. Vincent [27] in 1896 described fusiform bacilli associated with spirilla which he believed to be etiological factors in hospital gangrene.

The finding of *B. fusiformis* in so many diseased conditions has led to the accumulation in Europe and America of an extensive literature on the subject.

The references to the principal writers which we append will be found of assistance to future workers.

The evidence brought forward in this report shows :—

(1) That gingivitis exists in the Army among soldiers of all ages and categories admitted to hospital for other diseases to the extent of 12 per cent.

(2) That gingivitis is less prevalent amongst men returning from the front than amongst those who have not been out of the country.

(3) That the condition of the teeth of the soldier, like that of the civilian population, is not satisfactory.

(4) That gingivitis and decay of teeth increase as age advances.

(5) That fusiform bacilli and spirochætes are invariably present in large numbers in gingivitis and Vincent's disease of the mouth and throat.

(6) That fusiform bacilli are normal inhabitants of the mouth.

(7) That, in the absence of clinical symptoms, the presence of fusiform bacilli and spirochætes on the gums, mouth or throat, does not mean that a person has gingivitis or Vincent's disease.

(8) That the *B. fusiformis* is a pleomorphic organism, and when grown in pure culture may take on leptothricial and other forms, some of them suggesting spirochætes, and that these forms under various conditions can be again made to assume the typical fusiform shape.

(9) There is no evidence to show that the *B. fusiformis* ever develops into a true spirochæte.

(10) That the *B. fusiformis* is a non-motile organism.

(11) That *B. fusiformis* amboceptors are present in the serum of patients convalescent from an attack of Vincent's angina, and also in the serum of persons with fusiform bacilli in their mouths.

(12) That the spirochætes occurring in the mouth can be grown in suitable media, and that there are at least three varieties of these organisms, referred to in this report as *Spirochaeta buccale*, *Spirochaeta medium* and *Spirochaeta dentium*.

II.—GINGIVITIS ("VINCENT'S DISEASE").

There are three recognizable types of gingivitis: (1) acute ulcerative; (2) subacute; (3) chronic.

In this investigation only a few cases (three cases) of acute ulcerative were examined. The subacute and chronic forms were more common.

It is not pertinent to this pathological inquiry to consider the clinical aspects of these cases. But for purposes of diagnosis the following definition of the term "gingivitis" will suffice, and comprises:—

(1) Swollen or inflamed gums (local or general).

(2) Gums which bleed readily on touch or pressure, or there is a history of bleeding extending over some time.

(3) Pain may or may not be present, and, except in the acute ulcerative type, the patient is frequently unaware of the condition.

(4) Frequent association with pyorrhœa, i.e., discharge of pus from "sockets" of the teeth. Probably gingivitis is always associated with slight pyorrhœa, i.e., inflammation of periodontal membrane, which would be readily detected by dental experts.

(5) All conditions of teeth may be present. They may be clean and apparently healthy, or may be dirty and decayed. Gingivitis was not found in any man who had lost all his teeth.

Specimens from swabs from gums showed in every case fusiform bacilli, spirochætes and other bacteria.

In this inquiry Wassermann tests were not applied. The patients were not in hospital for syphilis. They were admitted for wounds or other diseases, a few for Vincent's angina, and acute ulcerative stomatitis.

McKinstry [17] tested for a Wassermann reaction in thirty unselected cases from a series of 157 cases of fuso-spirochætal affections of the mouth and pharynx, and found a negative reaction in all but two, both of whom admitted to 'having had chancres ten years ago; he also mentions that "the presence of a Wassermann reaction apart from concomitant syphilis has been reported by Gerber, Much, Laverio and Sobernheim," and adds that "the findings reported by them were made in the early days of the Wassermann reaction."

Bowman [4] states that, "in several hundred uncomplicated cases of Vincent's disease I have never found a positive Wassermann."

Attention is drawn to the fact that when "gingivitis" is referred to in official Army reports from the front or at home, the acute ulcerative form is meant.

In an interesting and instructive report on the Incidence of Ulcerative Gingivitis in the First Army (in France) by Captain C. G. Colyer [5], R.A.M.C., Advisory Dental Surgeon, First Army, statistical figures are given from two sources, viz. :—

(a) Reports from dental officers of the number of cases of acute ulcerative gingivitis occurring amongst patients seeking dental treatment. Seven thousand men received dental treatment in June, 1918, and of these forty-six had acute ulcerative gingivitis = 0·65 per cent.

(b) The result of the inspection of 900 men from various units of the Army, such as men returning from the trenches, and men on various duties behind the lines.

This inspection showed that acute ulcerative gingivitis was present in approximately 0·3 per cent of men behind the lines, and in 0·7 per cent of men returning from the trenches. He adds that "none of the cases found at inspection were severe, but all had definite sloughing of the interdental papillæ; and he also mentions "that simple gingivitis is present in a large number of men who do not keep their teeth clean, and periodontal disease is common amongst the older men and those who have always neglected their teeth."

With the object of obtaining some information on the extent to which gingivitis comes under the notice of dentists in the routine course of their duties, many dental surgeons, including those who had served in the Army (at the front and at home) and those in civil practice, were interviewed.

Their experience is that the acute ulcerative form of gingivitis is rare,

occurring only in about one per cent of patients coming for dental treatment; but subacute and chronic gingivitis are very common diseases. The Army dentists give figures varying from twelve per cent, to twenty per cent, and civilian dentists twenty per cent to thirty per cent of patients who come for dental treatment, and some give even higher figures.

These figures represent higher percentages than were found in this inquiry among men of all ages and categories; although in one of the units of the 3,000 men examined, thirty-three per cent had gingivitis, and in another unit 29.5 per cent (Table I).

The higher percentage given by these dentists might be accounted for in several ways.

(a) More exact diagnosis.

(b) Persons who seek dental treatment have bad teeth, and bad teeth means more cases of gingivitis.

(c) The 3,000 soldiers examined in this inquiry included many who required no dental treatment, and good teeth means fewer cases of gingivitis.

The higher percentage given by civilian dentists as compared with Army dentists is probably due to :—

(a) The greater prevalence of gingivitis amongst civilians than soldiers.

(b) A civilian dentist sees more patients over 40 to 50 years of age than an Army dentist, and gingivitis increases as age advances.

III.—THE CONDITIONS OF GUMS AND TEETH IN 3,000 MEN BETWEEN THE AGES OF 18 TO 35 YEARS AND UPWARDS.

To determine the prevalence of gingivitis amongst soldiers it was necessary to examine the mouth conditions of a large number of men.

A number of military hospitals in London and its vicinity were visited where wounded from the front, and men who had not been to the front, were undergoing treatment. The men were inspected for gingivitis and Vincent's disease, in the order in which they happened to be in the wards, and irrespective of whether they had been to the front or not. Notes of the diseases for which they were in hospital were made; age; service; whether they had been to the front, and if so for how long; conditions of teeth, mouth, throat and tonsils.

Three thousand men of all ages from 18 to 35 years and upwards were examined, and with the exception of 112 men who were middle-aged civilians called up for training, all were patients in hospital for wounds or other diseases not connected with the object of the examination.

The gums of 512 of these men were bacteriologically examined for the presence of fusiform bacilli and spirochætes, and in 234 the tonsils were also examined for these organisms.

The results of these examinations are given in Tables I, II, III, IV, V, and VI.

TABLE I.

Table showing the result of the clinical examination of 3,000 soldiers in England from 18 to 35 years of age and upwards, for the conditions of their teeth and gums.

The object of the examination was to obtain a census of the extent to which gingivitis or Vincent's disease existed in patients admitted to Military Hospitals for wounds or other diseases, and to note the condition of their teeth.

With the exception of 112 men who were middle aged recruits called up for training all were patients in Military Hospitals not connected with the object of the examination. They were examined in the order in which they happened to be in the wards and without any selection.

Tables II, III, IV, and V give information similar to what is shown in this Table, but according to age categories.

The terms "good teeth" and "bad teeth" are used in the sense that "good teeth" means not more than eight missing or decayed, and "bad teeth" more than eight missing or decayed.

Units examined	Number examined	Teeth all good	"Good" Teeth	"Bad" Teeth	Teeth all out	Dentures	Condition of teeth not examined	Gingivitis	Percentage of gingivitis
Patients in Millbank and Queen Alexandra Hospital	200	5	99	90	6	39	..	66	33
Men called up for Service and undergoing training	112	3	46	61	2	18	..	33	29.5
Patients in No. 1 Eastern General Hospital, Cambridge	1,030	68	536	416	10	161	..	105	10.19
Patients in Military Hospitals, Portsmouth and Cosham	701 examined for gingivitis and of these 550 were examined for teeth conditions	31	258	253	8	106	151	45	6.41
Officer patients in No. 1 Eastern General Hospital, Cambridge	52	4	28	20	..	10	..	2	3.84
Officer patients in Queen Alexandra's Hospital, Millbank	100	11	64	24	1	13	..	5	5
Patients in Military Hospitals, Southend-on-Sea	168	15	61	89	3	34	..	14	8.33
Patients in Queen Mary's Naval Hospital, Southend-on-Sea (Naval men).	103	11	53	36	3	13	..	11	10.68
Patients not over 25 years of age in No. 1 Eastern General Hospital, Cambridge	200	18	133	49	..	7	..	29	14.5
Patients at Military Hospital, Chelsea	334	19	182	180	3	53	..	49	14.67
Total	3,000 for gingivitis and of these 2,849 were examined for teeth conditions	185	1,410	1,218	36	454	151	359	11.9
		6.49 %	49.8 %	43.5 %	1.26 %	15.9 %	..	11.9 %	..

Of the 3,000 men and Officers of all ages from 18 to 35 and upwards examined 2,802 had been to the front (France and elsewhere), and these gave 215 cases of gingivitis = 10.7 per cent. 708 had not been to the front, and these gave 114 cases of gingivitis = 16.1 per cent.

TABLE II.

Table showing the details given in Table I in the case of 1,456 men and officers from 18 to 25 years of age.

Units examined	Number examined	Teeth all sound	"Good" teeth	"Bad" teeth	Teeth all out	Dentures	Condition of teeth not recorded	Gingivitis	Percentage of gingivitis
Patients in No. 1 Eastern General Hospital, Cambridge	125	74	474	176	1	51	..	63	8.6
Patients in Military Hospitals, Portsmouth and Cosham	366 for gingivitis, and 292 of those for teeth conditions	26	180	85	1	29	68	10	3.42
Officer patients in No. 1 Eastern Hospital, Cambridge	27	2	20	5	0	1	..	0	0.0
Officer patients in Queen Alexandra's Hospital, Millbank	48	8	32	7	1	4	..	0	0.0
Patients in Military Hospitals, Southend-on-Sea	81	13	36	32	0	6	..	4	5.0
Patients in Queen Mary's Naval Hospital, Southend-on-Sea (Naval men)	51	8	34	9	0	3	..	4	7.48
Patients in a Military Hospital, Chelsea	164	12	92	58	2	18	..	17	10.36
Total	1,456 for gingivitis, and 1,388 of these for teeth conditions	143	868	372	5	112	68	98	6.7
		10.3 %	62.5 %	26.8 %	0.36 %	8 %	..	6.7 %	

TABLE V.

Table showing the details given in Table I in the case of men and officers over 35 years of age.

Units examined	No. examined	Teeth all sound	"Good" teeth	"Bad" teeth	Teeth all out	Dentures	Condition of teeth not recorded	Gingivitis	Percentage of gingivitis
Patients in No. 1 Eastern General Hospital, Cambridge	192	4	46	134	8	53	..	38	19.8
Patients in Military Hospitals, Portsmouth and Cosham	107 for gingivitis, and 87 of these for teeth conditions	0	17	68	2	26	20	20	18.6
Officer patients in No. 1 Eastern General Hospital, Cambridge	4	0	0	4	0	2	..	0	0
Officer patients in Queen Alexandra Hospital, Millbank	10	0	7	3	0	2	..	2	20
Patients in Military Hospitals, Southend-on-sea	24	0	8	16	0	6	..	2	8.3
Patients in Queen Mary's Naval Hospital, Southend-on-sea (Naval men)	12	0	4	5	3	4	..	0	0
Patients in a Military Hospital, Chelsea	61	1	10	49	1	13	..	13	21.3
Total	410 for gingivitis, and 390 of these for teeth conditions	5	92	279	14	108	20	75	19.2
		1.29 %	23.6 %	71.5 %	3.6 %	27.69 %		19.2 %	

TABLE IV.

Table showing the details given in Table I in the case of 340 men and officers over 30, but not over 35 years of age.

Units examined	Number examined	Teeth all sound	"Good" teeth	"Bad" teeth	Teeth all out	Dentures	Condition of teeth not recorded	Gingivitis	Percentage of gingivitis
Patients in No. 1 Eastern General Hospital, Cambridge	126	4	49	72	1	29	..	15	11.9
Patients in Military Hospitals, Portsmouth and Cosham	91 for gingivitis, and 66 of these for teeth conditions	0	22	41	3	20	25	6	6.9
Officer patients in No. 1 Eastern General Hospital, Cambridge	13	1	6	6	0	2	..	2	15.4
Officer patients in Queen Alexandra's Hospital, Millbank	16	1	8	7	0	4	..	1	6.25
Patients in Military Hospitals, Southend-on-Sea	35	1	7	25	2	12	..	5	14.3
Patients in Queen Mary's Naval Hospital, Southend-on-Sea (Naval Men)	20	1	6	13	0	2	..	5	10.0
Patients in a Military Hospital, Chelsea	39	0	9	30	0	10	..	7	18.0
Total	340 for gingivitis, and 315 of these for teeth conditions	8	107	194	6	74	25	41	13.0
		2.54 %	33.9 %	61.59 %	1.9 %	25 %		13 %	

TABLE V.
Table showing the details given in Table I in the case of men and officers over 35 years of age.

Units examined	No. examined	Teeth all sound	"Good" teeth	"Bad" teeth	Teeth all out	Dentures	Condition of teeth not recorded	Gingivitis	Percentage of gingivitis
Patients in No. 1 Eastern General Hospital, Cambridge	192	4	46	134	8	53	..	38	19.8
Patients in Military Hospitals, Portsmouth and Cosham	107 for gingivitis, and 87 of these for teeth conditions	0	17	68	2	26	20	20	18.6
Officer patients in No. 1 Eastern General Hospital, Cambridge	4	0	0	4	0	2	..	0	0
Officer patients in Queen Alexandra Hospital, Millbank	10	0	7	3	0	2	..	2	20
Patients in Military Hospitals, Southend-on-sea	24	0	8	16	0	6	..	2	8.3
Patients in Queen Mary's Naval Hospital, Southend-on-sea (Naval men)	12	0	4	5	3	4	..	0	0
Patients in a Military Hospital, Chelsea	61	1	10	49	1	13	..	13	21.3
Total	410 for gingivitis, and 390 of these for teeth conditions	5	92	279	14	108	20	75	19.2
		1.29 %	23.6 %	71.5 %	3.6 %	27.69 %		19.2 %	

TABLE VI.
Summary of Tables I, II, III, IV, and V for gingivitis and conditions of teeth according to age categories.

Age	Number of men examined for teeth conditions	Percentage of men with perfect teeth	Percentage of men with "good" teeth	Percentage of men with "bad" teeth	Percentage of men with no teeth	Percentage of artificial teeth	Number of men examined for gingivitis	Percentage of gingivitis
18 to 25 years	1,388	10.13	62.97	26.8	0.36	8	1,486	6.7
25 to 30 years	444	4.7	43.9	50.6	0.6	22.9	482	9.54
30 to 35 years	315	2.54	33.9	61.59	1.9	25	340	13
Over 35 years	390	1.29	23.6	71.5	3.6	27.69	410	19.2
Patients in Millbank Hospital. Ages not recorded, but most of them were elderly men admitted from local garri- sons	200	0.5	49.5	45	3	19.5	200	33
Civilians called up for training. Ages not recorded. Their commanding offi- cer said their average age was over 40 years	112	2.7	41	54.47	1.78	16	112	29.5
All ages from 18 to 35 years and upwards	2,849	6.49	49.8	42.5	1.26	15.9	3,000	11.9

Table I gives the results for gingivitis and teeth conditions for the combined 3,000, and Tables II, III, IV, and V according to age categories.

Table VI gives a summary of the principal items in Tables I to V.

Table VII and its summary shows the number of cases of gingivitis, and gives the results of the bacteriological examination of gums and tonsils for *Bacillus fusiformis* and spirochætes.

Table VIII gives the results of the bacteriological examination of the gums of twenty-five children from the ages of 4 to 13 years for the presence of *B. fusiformis* and spirochætes.

It will be noticed in Tables I and VII, where a comparison is drawn between those who had and those who had not been to the front, that gingivitis was more prevalent amongst those who had not been to the front.

Of 3,000 men of all ages (Table I) among 2,292 who had been to the front, there were 245 cases of gingivitis = 10·7 per cent; and among 708 who had not been to the front 114 cases = 16·1 per cent.

Another interesting item in Table I is the unit of 701 men examined at Portsmouth and Cosham. All these men had been to the front, the majority being just returned from France, and were examined within a few days of the time they left the trenches. In this unit there were forty-five cases of gingivitis = 6·41 per cent. In Table II it will be seen that in 366 of these 701 men, who were not over 25 years of age, the number of cases of gingivitis was 10 = 3·42 per cent. All of the 366 had just returned from the trenches. There were no cases of the acute ulcerated form of gingivitis amongst this unit of 701 men.

Table VII shows eight per cent of gingivitis in 100 men not over 25 years of age, who had been to the front, and twenty-one per cent in 100 men of a similar age who had not been to the front.

It has been suggested that naval men have better teeth than soldiers, and that gingivitis is less prevalent in the Navy.

One hundred and three naval men of all ages from 18 to 35 years and upwards, were examined in Queen Mary's Naval Hospital, Southend-on-Sea, and among these there were eleven cases of gingivitis = 10·68 per cent; a result somewhat similar to what is found in the Army, and the condition of their teeth was about the same as the soldiers.

The question of defective teeth is a more serious one, and the issues involved are greater, and more urgent. A study of the tables will suffice to illustrate its gravity, and the extent to which bad teeth exists in the present day Army.

Bad teeth are not only a direct factor in giving rise to pain and discomfort, but also an indirect factor in giving rise to diseases which increase the number of those who seek hospital treatment. The loss of grinders is of more importance than the loss of incisors.

When the teeth are bad the mucous membrane in their vicinity is generally in a damaged condition, and gingivitis frequently present. In

addition to an increased number of the fusiform bacilli and spirochætes as compared with normal mouths, and good teeth conditions, there will also be a marked increase in the growth of the numerous other species of mouth bacteria.

Those who suffer from gingivitis, pyorrhœa, or decaying teeth and irritating stumps readily absorb and become affected by the septic products which are invariably present. Mouths in which these conditions were present were frequently examined. Septic mouths were generally found in patients admitted to hospital for debility, dyspepsia, neurasthenia and in some cases of heart and joint trouble. The etiology of carious teeth did not come within the scope of this investigation.

In the meantime can anything be done to minimize the conditions of teeth and gums existing among soldiers of all ages? The answer rests with *cleanliness of the mouth and skilled attention to the teeth*.

(1) More attention should be directed to the hygiene of the soldier's mouth. The mouth should be washed twice a day, and the tooth-brush used for brushing the teeth and gums.

(2) The importance of mouth hygiene as a factor in the prevention of diseases of the mouth and gums and decay of teeth, should be instilled into the men by those responsible for their health.

(3) Dental History Sheets should be provided as official Army documents.

(4) Dentists should be taken into the Army for whole time duty, and in sufficient numbers to attend to the soldiers' teeth. The dentist should record the condition of the teeth of all recruits on their Dental History Sheets; every subsequent dental disease, treatment, supply of dentures, etc., during a man's service should be noted on his sheet by the dentist who treats him.

The pay and pension of Army dentists instead of being an extra expense on the country would in reality mean a large saving in the shape of improved health, fewer admissions to hospital, and less invaliding.

IV.—RESULTS OF THE BACTERIOLOGICAL EXAMINATION OF GUMS AND TONSILS FOR *BACILLUS FUSIFORMIS* AND *SPIROCHÆTES*.

In gingivitis, Vincent's angina and allied conditions of the mouth and throat, *B. fusiformis* and spirochætes are invariably present and generally in large numbers. Several workers have also found these organisms in a large percentage of healthy mouths.

Bowman [4] examined the mouths of 1,000 Canadian soldiers in a camp in England and found Vincent's organism present in $532 = 53.2$ per cent, and gingivitis in $79 = 7.9$ per cent. These men were considered in two classes, those with clean and those with unclean mouths.

In 816 who had clean mouths, Vincent's organisms were present in $334 = 40.9$ per cent, and gingivitis in $20 = 2.45$ per cent.

In 184 who had unclean mouths Vincent's organisms were present in 139 = 75.5 per cent, and gingivitis in 59 = 32 per cent.

In all those who had gingivitis, fusiform bacilli and spirochætes were present in large numbers, but in the other cases in which these organisms were present they were few in numbers.

McKinstry [18] examined smears from the throats of 1,320 soldiers and found fuso-spirochætal organism in 32 = 2.43 per cent; he also examined smears from the gums of 230 healthy men who had not yet started military life and found 95 positive = 41.3 per cent. Vincent [27, 28 and 29], Mühlens [19], Tunncliffe [25] and others have found fusiform bacilli and spirochætes in varying percentages of healthy mouths.

The gums of 512 soldiers of all ages from 18 to 35 years and upwards, and the tonsils of 234 of these men were examined; the gums of 25 children from the ages of 4 to 13 years were also examined. The results of these examinations given in Table VII and its summary, and in Table VIII, show that fusiform bacilli and spirochætes are present in the mouth of all those who have teeth.

They are few in number in healthy and clean mouths, but numerous in unclean and unhealthy mouths.

In the preparation of specimens from the gums and tonsils small cotton wool swabs previously sterilized were used. These small swabs were easily introduced into the intervals between the teeth, and between the teeth and the gums. In apparently healthy mouths casual swabbing along the surface of the gums may fail to find fusiform bacilli and spirochætes when they are few in numbers; but in diseased conditions a gentle rub of the swab along the diseased surface is sufficient.

Slide specimens were prepared from the swabs taken from the mouth. These were fixed by passing through the flame, and stained with weak carbol fuchsin.

TABLE VII.

Table showing the results of the bacteriological examination of the gums of 512 soldiers of all ages from 18 to 35 years and upwards for the presence of *Bacillus fusiformis* and spirochaetes.

In the case of 234 of these men the tonsils were also examined.

The object of the examination was to find out to what extent these organisms were normally present in the mouth or on the tonsils. Of the 512 examined, 400 were patients in military hospitals, either for wounds or diseases other than gingivitis or Vincent's disease, and about half of them had been to the Front; 112 were middle-aged men called up for training, of whom 100 had never previously been in the Army. Of the 400 who were patients in military hospitals, 200 were under 25 years of age, of whom 100 had been to the Front and 100 had not been out of England.

The conditions of the teeth and gingivitis are also added, although these have already been given in previous tables.

Units and number of men examined	Teeth all sound	"Good" teeth	"Bad" teeth	Teeth all out	Dentures	Gingivitis	Bacteriological examination.			
							<i>Bacillus fusiformis</i>		Spirochaetes	
							Gums	Tonsils	Gums	Tonsils
78 men in Millbank Hospital	1	30	45	2	9	26	76	Not examined	76	Not examined
122 men in Queen Alexandra and Millbank Hospitals	4	53	61	4	22	40	109	35	111	54
112 middle-aged men called up for and undergoing training	3	44	63	2	19	33	110	43	107	54
100 men in No. 1 Eastern General Hospital who had been to the Front and not over 25 years of age	9 %	73 %	18 %	0	8 %	8 %	96 %	Not examined	96 %	Not examined
100 men in No. 1 Eastern General Hospital who had not been to the Front and not over 25 years of age	6 %	63 %	91 %	0	1 %	21 %	98 %	Not examined	98 %	Not examined
Total of 512 men of all ages from 18 to 35 years and upwards	23 4.55 %	263 51.36 %	218 42.57 %	8 1.56 %	59 11.5 %	128 25 %	489 95.5 %	78 33.3 %	488 95.3 %	108 46.1 %

SUMMARY OF THE PRINCIPAL ITEMS IN TABLE VII.

Of 512 men of all ages from 18 to 35 years and upwards.

Fusiform bacilli were found on the gums of 489 men = 95·5 per cent.

Spirochætes were found on the gums of 488 men ... = 95·3 „

Gingivitis was present in 128 men ... = 25 „

Of 234 of the men whose tonsils were also examined—

Fusiform bacilli were found on the tonsils of 78 men = 33·3 „

Spirochætes were found on the tonsils of 108 men = 46·1 „

Gingivitis was present in 73 men ... = 31·2 „

None of these men suffered from any diseased condition of the tonsils.

Fusiform bacilli and spirochætes could not be detected in swabs from the gums of seven of those men who had no teeth. A few of these organisms were found in specimens from the gums of the eighth man. The possibility of hidden stumps was not excluded.

The result of the bacteriological examination of 200 men not over 25 years of age, 100 of whom had been to the Front, and 100 who had not been, is practically the same in both units; but there is a marked difference in the extent to which gingivitis was present, viz., eight per cent in those who had been to the Front, and twenty-one per cent in those who had not been. The teeth of those who had not been to the Front were in a worse condition than the teeth of those who had been to the Front.

TABLE VIII. — TABLE SHOWING THE RESULTS OF THE BACTERIOLOGICAL EXAMINATION OF THE GUMS OF CHILDREN FROM 4 TO 13 YEARS OF AGE FOR THE PRESENCE OF *B. fusiformis* AND SPIROCHÆTES.

Number examined	Good teeth	Bad teeth	Gingivitis	<i>B. fusiformis</i>	Spirochætes
25 ..	25 ..	— ..	— ..	25 ..	25 ..

Cultivations in serum broth were made from four of the cases taken without selection, and fusiform bacilli were grown from all four, and in one of these cases spirochætes multiplied in the culture (serum broth).

The children were inmates of the Guards Orphans Home, Francis Street, Westminster. They were in good health, clean and well looked after, and their mouths were also clean and the teeth good. None of them had gingivitis.

In the circumstances it was not considered necessary to examine any more children.

(To be continued.)

SOME NEW OBSERVATIONS ON THE ETIOLOGY AND TREATMENT OF SEBORRHŒIC ERUPTIONS. A PRELIMINARY REPORT.

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THE widespread distribution and intractability of seborrhœic eruptions among troops on active service will sufficiently excuse a somewhat premature and abbreviated publication of some new conceptions on their nature and treatment.

The condition is very prevalent, and Major H. MacCormac, R.A.M.C., was fully justified in his assertion at a recent lecture "that there is practically no skin disease in the Army that is not complicated by seborrhœa." The manifestations are protean, and include such apparently widely differing eruptions as a crusted and weeping eczema of the scalp, a dysidrotic eczema or cheiropompholyx of the fingers, and a patch of lichenification on the calf of the leg.

The appearances vary according to the anatomical situations and chronicity of the lesions, and the degree of secondary microbial infection; the dermatological text-books, which are based entirely on the records of ordinary civil experience, will afford but a moderate degree of assistance in their elucidation. Every medical officer on active service will have met with the military varieties of the disease.

For convenience they may be classified in three groups:—

(1) Those which arise on the scalp, face, ears and neck.
(2) Those which are found on the trunk below the neck, and on the extremities, and which are very commonly associated with one or both of the two exceedingly common parasitic diseases—scabies and pediculosis. The regions then involved correspond very closely with the sites most commonly affected by the *acarus* and *pediculus*, and will not be separately dealt with in this communication.¹

(3) Those which arise on the trunk and limbs, and have no demonstrable association with either scabies or pediculosis. They are mainly follicular, and not generally acute in type, and form the large bulk of cases which in

¹ *Vide* MacCormac: "Skin Diseases and their Treatment under War Conditions," *Proc. Roy. Soc. Med.*, 1917, vol. x, pp. 121-149. MacCormac and Small: "The Scabies Problem on Active Service," *Brit. Med. Journ.*, September, 1917. Semon and Barber: "Pyoderma of Parasitic Origin," *Brit. Journ. Dermat. and Syph.*, July, 1917.

civilian practice are grouped together under the term of "eczema." Want of space forbids a detailed discussion of this group also.

CLINICAL APPEARANCES OF SEBORRHŒIC ECZEMA OF THE HEAD AND NECK.

In the most acute stage the primary lesions are groups of small vesicles on an erythematous base. These are seldom seen, as the associated pruritus leads almost immediately to their forcible rupture by scratching. The serum exuded becomes rapidly infected by the ordinary pyogenic cocci, and a septic crust results. The appearance at this stage is not unlike that seen in the "impetigo contagiosa" of hospital out-patient departments, and is doubtless responsible for much confusion both as regards nomenclature and treatment. It must be remembered that in seborrhœic dermatitis the crust covers a patch of "eczema" easily irritated by strong applications, whereas in impetigo contagiosa there is no such underlying condition present, and the local infection rapidly clears up with the destruction of its cause—a streptococcus—and does not tend to relapse.

In the acute condition, as it affects the head and neck, we find crusting and weeping patches of eczema on the scalp, eyebrows, and beard regions. On the ears, where the skin is relatively thin, exfoliation and bleeding sometimes result, and there is frequently an associated eczema of the external auditory meatus. Deep and intractable septic fissures commonly persist in the post-aural folds, and tax the skill and patience of the physician to the utmost.

In about eighty-five per cent of these cases there is associated seborrhœic dermatitis of the anterior and posterior mid-thoracic regions, while a common and troublesome sequela is the development of constantly recurring boils, especially on the neck just below the scalp margin. *In a very large number of our cases we have noted, in synchronism with the above described skin lesions, an associated nasal and nasopharyngeal catarrh, to which we shall presently refer.* The stage of subsidence is characterized by desiccation of the lesions and separation of the crusts. Its duration is variable, and depends largely on the scientific application of suitable remedies. Inspection of the scalp in the acute stage commonly reveals congestion and erythema of the epidermis. This persists on the scalp and eyebrows for a considerable time after all other traces of the affection have subsided. The patient who has once had an attack of the kind above described is very liable to relapse. In this respect the clinical history resembles the civilian prototype of the disease, and it was this consideration that first led us to the conception of an underlying constitutional dyscrasia, which might be responsible not only for the skin eruptions, but also for the not uncommonly associated nasal and nasopharyngeal catarrh.

In this assumption we are supported by an eminent French dermatologist—J. Darier—who in his well-known text-book—"Précis de

Dermatologie"—has correlated the tendency to seborrhœic eruptions with a peculiar type of skin, to which he has given the name "Kerose."

The clinical stigmata of "Kerose" are briefly :—

(1) A brownish or dirty yellowish complexion.

(2) Wide-mouthed and prominent pilosebaceous follicles, with hyperkeratosis of their orifices.

(3) A slight thickening of the skin, with diffuse hypertrophy of the horny layer, and a tendency to fine desquamation.

It is on this substratum of terrain that seborrhœic manifestations most commonly appear.

In the first decade of life there may be pityriasis sicca of the scalp; towards puberty and after seborrhœa oleosa; and from the fifteenth to twenty-fifth years we frequently find some vulgaris, rosacea, and the so-called eczematides; while seborrhœical opecia takes its origin between the twenty-fifth and thirtieth years.

The areas of the body affected are both diffuse and regional. The middle area of the face, the medi thoracic regions, the flexures of the limbs, and the pubic and internatal regions, are peculiarly susceptible.

The etiological factors are, according to Darier, two in number. Sexual development, and erroneous diet, in which excessive carbohydrates and stimulants, faulty mastication, constipation, etc., all play a part. Darier's conception has found many supporters in the dermatological world. In his view the bacteria described as specific by Sabouraud and Unna (and always met with abundantly in seborrhœic lesions) owe their activity and pathological effects mainly to the soil on which they are growing, which in its turn is dependent on the underlying constitutional state of the patient.

We are entirely in sympathy with this opinion, and we believe that the frequent relapses exhibited by patients with such eruptions are thus explained. It is true that local treatment alone will remove the seborrhœic eruptions, but the same is the case with psoriasis, the constitutional basis of which is now admitted by nearly all dermatologists of note.

A careful study of many hundreds of cases of seborrhœic eczema has convinced us that the main factor in their production is a metabolic dyscrasia, or error in biological assimilation, while external irritants such as parasites, mustard gas, and bacteria are the excitements, and play but the part of spark to powder.

The frequent association of nasal and nasopharyngeal catarrh with the outbreak on the skin, suggested a close relation between them, and one of our colleagues, Captain C. Jones-Phillipson, a specialist and writer on diseases of the upper respiratory tract, very kindly undertook the examination of a large number of cases submitted to him. A full report of his findings will, it is hoped, be published by himself or in collaboration with us, at some future date. Suffice it here to say that, in fifty-nine out of ninety-three cases examined, a posterior rhinoscopy revealed a yellowish mucopurulent secretion. The discharge varied in amount. In some cases

the vault of the nasopharynx was coated, as if painted over with a scum-like mucus; in others again, it was in amount sufficient to be expressed into the pharynx on exciting a forcible elevation of the soft palate. In a further twenty-four of these cases were demonstrated conditions of the nose and nasopharynx sufficient to warrant the supposition that a similar state of sepsis as in the fifty-nine already recorded had previously existed and recurred from time to time.

Simultaneously with his examinations some bacteriological experiments were carried out, with a result that a *streptococcus of the faecalis group* (in addition to numerous staphylococci) was recovered from both the nasal mucosa, and the eruptions on the skin, in many such patients.

Darier does not lay stress on the nasopharyngeal catarrh so commonly associated with seborrhæic eczema, but we were greatly assisted in our thesis by a perusal of some clinical studies in children by Czerny.¹ His findings may be shortly summarized under three or four headings:—

(1) Certain children present a congenital susceptibility to catarrh, i.e., to bacterial infection of their skin and mucous membranes, as well as to certain nervous disturbances. To this tendency he gives the name of *Exudative Diathesis*.

(2) The manifestations of this diathesis are provoked by excess of diet, and its subjects are particularly intolerant of carbohydrates and fats.

(3) As a result of the repeated acute infections of the mucous membranes and skin, each of which is usually accompanied by an abnormally high temperature, secondary changes take place in the lymphoid tissues of the body, giving rise to adenoid vegetations, parenchymatous tonsillitis, and adenitis, especially localized to the cervical glands.

(4) The condition known as the status lymphaticus is the extreme or end form of the exudative diathesis.

In England, Dr. H. C. Cameron (*Brit. Med. Journ.*, June 9, 1917) is a strong supporter of Czerny's views. He adduces an important observation of his own and points out that children of the exudative diathesis (or as he prefers to call it—the status catarrhalis) are subject to an extreme "wateriness" of their tissues, which gives them a fictitious appearance of plumpness. Their really wasted condition is revealed in three or four days, by exclusion or reduction of their carbohydrate dietary, and there is a coincident loss of weight. A return to plumpness is ensured by a resumption of the bread and sugar, which in pre-war days were the staple ingredients of most meals in certain classes of society.

It will be noted that both Czerny and Cameron lay considerable emphasis on the etiological importance of a carbohydrate dietary in the production or aggravation of the exudative diathesis. We do not believe that an excess of carbohydrates plays the main part in the production of

¹ Vide "Jahrbuch der Kinderheilkunde," 1905, p. 199; 1909, p. 529.

seborrhœic eczema, but we are convinced that excess in this respect has a contributory and possibly a deciding influence in the production of the acute manifestations. Many of our patients have admitted excess—several an almost exclusive dietary of sweet biscuits, jam and chocolate prior to the onset of their eruptions—but the metabolic problem will be discussed as a whole, subsequently.

There are in our collective experience two types, mainly, of seborrhœic individuals.

(1) Those congenitally predisposed, or who have acquired the tendency in infancy. These patients give a history of operations for adenoids, glands in the neck, frequent attacks of bronchitis, eczema, etc., in their childhood. They have thus in their youth conformed in all respects to the type of individual described by Czerny as exhibiting the "exudative diathesis."

(2) Those in whom the state has suddenly appeared as the result of active service, and its inevitable conditions.

(1) Patients who conform to the first type, as may have been supposed, are more difficult to treat, and far more likely to relapse after apparent cure, than individuals in the second group. The subject is usually a young adult with the adenoid facies, prominent and often carious teeth, high-arched palate, enlarged tonsils, and the victim of constantly recurring colds and sore throat, bronchitis, asthma, etc., with which have been associated for many years or "as long as he can remember," acute outbreaks of eczema of the scalp, ears, face, trunk and extremities, each attack of which appears to have become more obstinate and difficult to get rid of than the last.

(2) The second type of affected individual develops his symptoms for the first time on active service. An inquiry into his past history does not usually elicit a story of frequent colds or catarrhal attacks. The configuration of the upper respiratory tract is apparently normal, although there is often an associated sub-acute nasopharyngitis of the type noted as characteristic by Captain Jones-Phillipson. Prognosis as regards cure is better in this type of case, and relapse less likely to occur.

THE URINE OF SEBORRHÆIC PATIENTS.

There is one feature in our united experience which is common to both types of seborrhœics, and that is a pronounced and remarkably constant hyperacidity of the urine. It was this association that first led one of us (H. W. B.) to the assumption that *the seborrhœic state is really a manifestation of acidosis*. It has been proved by us again and again that as soon as the urine becomes amphoteric, or is made alkaline by the administration of drugs by the mouth, the acute stage of a seborrhœic eruption comes to an end, and the patient rapidly improves in health, and that conversely the urine is invariably acid at the onset of a relapse. The chemical examination of the urine, it is true, has never yet revealed the presence of di-acetic

or β -oxybutyric acids, nor is it suggested that the degree of acidosis present at all resembles that commonly met with in diabetes, but it is not to be denied that there are certain resemblances in the clinical features of the two diseases.

The striking susceptibility in both to secondary infections, such as carbuncles and boils, the congested appearance of the extremities, the hyperacidity of the urine, and the reaction to treatment by alkalies, are worthy at least of cursory examination.

The chemical investigation of the condition of relative acidosis in such cases as we have delineated is still incomplete; but one test suggested by A. W. Sellards ("Principles of Acidosis," Chapter IV., 1917), and considered by him to be the most delicate, was applied to a large number of cases. This test consists in determining the "alkaline tolerance." The meaning of this phrase may be explained as follows:—

The normal alkalinity of the blood depends on the existence in it of certain fixed bases—chiefly carbonates and phosphates—these are the so-called "buffer" salts. They combine with and partially neutralize acids: without their presence, acid products of metabolism—e.g., CO_2 and lactic acid—would render the reaction of the blood so acid as to be physiologically intolerable.

In a normal person with a sufficiency of these fixed bases in his blood and tissues the intake of any appreciable quantity of alkali, e.g., sodium bicarbonate, is followed by its immediate excretion in the urine. If however, the fixed bases are deficient, additional alkali taken, instead of being excreted, is stored in the tissues and the urine remains acid.

Sellards has shown that five grammes (i.e., about seventy-five grains) of sodium bicarbonate given by the mouth is practically the upper limit of the normal tolerance, this amount being almost invariably sufficient to change the reaction of the urine of a normal person from acid to alkaline. In cases of acidosis very much larger quantities must be given before the action of the urine changes.

THE ALKALINE TOLERANCE OF SEBORRHÆIC PATIENTS.

When the possibility of the existence of acidosis in seborrhæic patients first occurred to us we immediately began to test the therapeutic effects of giving them an alkaline mixture thrice daily an hour or half an hour before meals. Our original mixture consisted of sod. cit. 30 grains; sod. bicarb., pot. carb., $\bar{a}\bar{a}$ 15 grains; inf. gent. comp. 1 ounce. The beneficial result of this treatment was apparent, but it was observed that many patients did not pass alkaline urine until after they had taken the medicine for many days or even weeks, and in some the urine remained persistently acid. We then decided to employ a mixture modelled on a formula suggested by Dr. Langdon Browne for the control of acidosis in diabetes, viz., sod. bicarb., 1 drachm; pot. cit., 30 grains; calc. lact., 5 grains; mag. carb.,

5 grains; aq. chlorof., 1 ounce. This preparation has now been given in hundreds of cases, and careful observations have been made on the reaction of the urine from day to day. As a result of its use two fundamental facts have been established:—

(1) That the majority of patients with seborrhœic manifestations show a markedly increased alkaline tolerance, many of them to an astonishing degree.

(2) That in nearly all cases, once the urine has been rendered alkaline all active inflammatory processes cease, and the eruption rapidly clears.

As examples of unusual alkaline tolerance the following cases may be quoted:—

Case 1.—This patient took 4 ounces of above mixture per diem for three days; urine still strongly acid; then 6 ounces per diem for twelve days; urine still acid; then 9 ounces per diem for two days, urine still acid; after 9 ounces per diem for two more days urine became alkaline. That is to say this patient consumed during a period of nineteen days 15 ounces of sod. bicarb. and $7\frac{1}{2}$ ounces of pot. cit. without passing an alkaline urine and it was not until he was taking 9 drachms of sod. bicarb. and $4\frac{1}{2}$ drachms of pot. cit. per diem that an alkaline urine was obtained.

Case 2.—This patient took 3 ounces of the mixture daily for twenty-two days; urine still acid at the end of this time. He then took $4\frac{1}{2}$ ounces per diem for three days and 9 ounces per diem for two days; urine still acid. After taking 9 ounces per diem for five days urine became alkaline.

Case 3.—This patient consumed 6 ounces of the mixture per diem for twenty-one days and his urine was still strongly acid at the end of this time.

Many other cases showing a similar alkaline tolerance could be given. Such extreme instances are, however, exceptional, but the very great majority of patients with active seborrhœic lesions show a tolerance far greater than that observed in normal persons, in whom *one single dose* of the mixture is sufficient to render the urine alkaline.

THERAPEUTIC EFFECT OF ALKALIES IN SEBORRHÆIC PATIENTS.

After studying the effect of giving alkalies in some 300 cases with seborrhœic manifestations we have satisfied ourselves that their action may be described as specific. As remarked above the tolerance varies in different persons, so that the quantity of alkali required to produce the desired effect must be determined by repeated examination of the urine.

In the great majority of cases the activity of the inflammatory processes ceases as soon as the urine is rendered virtually alkaline.

So constant is this phenomenon that it is almost always possible to predict with confidence that, should a patient under alkaline treatment present new or active lesions (e.g., eczema or boils), his urine will be found to be still acid; an increased quantity of alkali must therefore be given until the reaction of the urine changes.

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As might be expected, the lower the alkaline tolerance the more rapid is the reaction to treatment, and the less the tendency to relapse.

The most convincing clinical proof of the influence of alkalies in these cases was afforded by patients, in whom, after an initial cure, active seborrhœic manifestations recurred when the alkaline mixture was discontinued, only to disappear again, often without any local application when the alkaline treatment was resumed.

The following is a brief extract from the clinical notes of three such patients:—

(1) J. A., admitted February 23, 1918.

Symptoms.—Severe localized patches of moist seborrhœic eczema on right cheek. Stains of old lesions on right eyebrow.

Urine Index.—Intensely acid.

Treatment	Date	Condition	Urine
Mist. sod. cit., 2 oz., t.d.s., a.c.	.. 24.2.18	Patches on face drying up	Acid.
" " " "	.. 28.2.18	Marked improvement ..	Alkaline.
Omission of "medicine" ..	.. 7.3.18	—	—
Resumption of mist. as above	.. 18.3.18	Patch on chin persistent.	Acid.
" " " "	.. 20.3.18	Left eyebrow impetiginized	Alkaline.
" " " "	.. 22.3.18	Lesions much improved ...	Alkaline.
" " " "	.. 31.3.18	Chin slowly improving.	Alkaline.
" " " "	.. 31.3.18	Cheek healed	—
" " " "	.. 31.3.18	Quite healed	—

N.B.—Improvement dates from resumption of medicine. The local treatment was the same, viz., calamine liniment throughout.

(2) F. A., admitted January 19, 1918.

Symptoms.—Very seborrhœic type. Face: acute weeping, seborrhœic eczema; typical nasopharyngitis, boils on back. Previous similar attack in France, 1916. Has had slight attacks in civil life also.

Urine.—Acid.

Treatment	Date	Condition	Urine
Mist. sod. cit., 1 oz., t.d.s., a.c.	.. 19.1.18	—	Acid.
—	.. 22.1.18	—	Acid.
—	.. 24.1.18	Improvement noted, but slow	Less acid.
Increased to 2 oz., t.d.s., a.c.	.. 26.1.18	Much improved	Less acid.
All treatment omitted ..	.. 29.1.18	" "	Slightly alkaline.
2 oz. t.d.s. from this date ..	.. 31.1.18	First relapse	—
Mist. sod. cit. again omitted	.. 6.2.18	Condition again quiescent	Neutral.
Resumption 2 oz., t.d.s., a.c.	.. 16.2.18	Second relapse. Now acute	Very strongly acid.
2 oz. mist. sod. cit., t.d.s., a.c.	.. 22.2.18	Whole appearance changed and on 23.2.18 was quite free of all lesions	Alkaline.
" " " "	.. 1.3.18	Condition was satisfactory	Urine amphoteric.

N.B.—Two well-marked relapses followed omission of mist. sod. cit. Local treatment throughout—calamine liniment.

The following striking report was specially examined for the purposes of this paper, and the case is under treatment at the time of writing.

(3) A. O., admitted June 6.

June 9, 1918.

Symptoms.—Active scattered impetigo on chin, root of nose and both ears.

Urine.—Very acid.

Treatment	Date	Condition	Urine
Mist. sod. cit., 1 oz.	7.6.18	As above	Very acid.
"N.B."—Double dose of mist.	9.6.17	As above	Still acid.
" " 2 oz.	11.6.18	Lesions on face much improved	Alkaline.
Medicine now omitted	13.6.18	Fresh acute lesions, left eyebrow	Again acid.
Resumption of mist. sod. cit., 1 oz., t.d.s., a.c.	15.6.18	Left eyebrow clearing ..	Now alkaline.
Medicine again omitted	17.6.18	Seb. eczema of rt. ext. auditory meatus	Again acid.
Repetition of mist. sod. cit., 2 oz., continued without local treatment.	22.6.18	Patient seen this morning. All lesions completely healed.	Urine alkaline.

Local treatment throughout—calamine liniment.

N.B.—The relapses in this case followed the omission of the mixture, with an almost mechanical precision.

In two cases of acute seborrhœa of the head and face, of which we have the photographs (to be published when opportunity affords), no local treatment whatever was given, neither lotion, powder, ointment nor fomentation from the day of admission to the day of discharge. The affected areas cleared up completely under the influence of the above described alkaline mixture, in the first case in one week, in the other in ten days from the date of commencement of treatment.

LOCAL TREATMENT.

It is not hereby contended that administration of alkalies abolishes the necessity for local applications, but it is claimed that this method of treatment hastens in remarkable fashion the clearing of the various eruptions dependent on the seborrhœic state, and provided that the patient be then given an adequate quantity of alkaline salts per diem, relapses will not occur.

The best local applications are oily alkaline suspensions of calamine, e.g. :—

℞ Calamine præp. gr. xxx.
 Aqua calcis. dr. ii.
 Ol. arachis. ad oz. i.
 vel Ol. olivæ.

Most seborrhæic lesions are amenable to this application, which should be renewed not less than twice daily, on lint.

When oil is difficult to obtain in sufficient quantity, we have found bicarbonate of soda in two per cent solution in water, very useful. It must be applied thrice daily at least, as a "soak" on lint under jaconet, and should be changed once during the night if the lesions are very acute.

At a later stage when erythema and congestion with irritability of the skin surface persist, the part should be covered with lint or linen smeared with Lassar's paste. All hairy parts with the exception of the eyebrows and lashes, should be close-cropped or shaved.

We consider that the curative value of local alkaline treatment rests on the same fundamental principle as the administration of alkalies by the mouth. *Practically all pathogenic bacteria prefer slightly acid media.* One and the same inoculation from a seborrhæic eyebrow on two agar slopes of different reactions afforded some exceedingly interesting and significant results, and opened up a large field for speculation. The normal slightly acid medium produced an abundant growth of *Staphylococcus aureus* and *albus*, with numerous small clear colonies of streptococci. On the other slope, the reaction of which was just alkaline to litmus there were found no streptococci at all, and the comparatively few colonies of staphylococci that grew were of the *albus* variety only, and markedly pleomorphic and degenerative in type. Much work on these lines remains to be done.

We have purposely avoided a prolonged examination of the theoretical considerations that underlie the mechanism of acidosis, but we desire to raise one question as to its mode of production in patients with the status seborrhæicus.

In his very admirable summary of the normal mechanism whereby a slightly alkaline reaction of the blood is continuously maintained, Sellards upholds three factors as of primary importance (pp. 10 to 11, reference above).

- (1) Intake of fixed bases in the food.
- (2) Elimination : (a) of carbon dioxide by the lungs ; (b) of acid by the kidney.
- (3) Neutralization of acid in the body by ammonia.

Now the fixed bases in the food are derived mainly from fresh vegetables and fruit, and a deficiency of these is well known to lead to a decrease of the alkaline salts, particularly the carbonates, and the mono-acid di-basic phosphates of sodium, calcium and magnesium—the so-called buffer salts—in the blood and urine.

The army ration, excellent in all other respects, may be unavoidably deficient in just those fresh materials that are most important in maintaining the requisite equilibrium between acid and basic radicals.

We have eliminated scurvy, a serious factor in the campaigns of

previous centuries, by the judicious selection of dietary, and by our advances in the preservation of protein substances.

At this juncture it would be altogether premature to lay it down as an axiom that the modern army ration is responsible for the seborrhœic diathesis, but we will go so far as to suggest that it is probably contributory, directly or indirectly, in its production and aggravation. The biological influence of carbohydrates in the production of the catarrhal state, on which Czerny and Cameron lay great stress, is in our opinion an accessory factor. We may here cite the case of one of our colleagues—himself a dermatologist—with a remarkably seborrhœic diathesis. He can produce at will (and has twice actually done so experimentally) an acute typical seborrhœa of the head and face, by rapid ingestion of an excessive quantity of sugar.

It may be assumed that if the digestion and other functions of the body proceed normally, carbohydrate if taken in moderate quantity is completely oxidized to CO_2 and water; but if for any reason oxidation is interfered with, intermediate acid substances—of stronger acidity than CO_2 —remain incompletely oxidized, and in the absence of a sufficiency of neutralizing buffer salts, tend towards a reduced alkalinity of the blood and tissue fluids. Similarly, according to Sellards and other writers, protein, particularly meat, is one of the chief sources of acid substances, during its metabolism. This being granted, an *excess* of meat (which is supplied very generously to our armies) will itself tend to the production of acidosis, and will thus reinforce the action of the carbohydrate factor in this direction.

A condition of relative acidosis is produced on these assumptions by two factors:—

- (1) A deficiency of the "buffer salts" that counteract the production of acid.
- (2) An increased production of acid substances, probably owing to faulty metabolism of excessive carbohydrate and protein substances in the diet.

CONCLUSIONS.

As a result of our investigations we may conclude:—

- (1) That there is a constitutional state, which may exist from infancy or may appear *de novo* in adults, and which may be termed the status catarrhalis or exudativa (Czerny). Where this condition exists the skin and mucous membranes show an abnormal susceptibility not only to various bacterial infections, but also to mechanical and chemical irritations.
- (2) Persons in whom the status catarrhalis is present, either permanently or temporarily, are liable to develop the multitudinous eruptions which have been variously termed seborrhœic eczema or dermatitis, true eczema, pustules, boils and the wrongly termed "impetigo," really an impetiginized seborrhœic eczema. These manifestations in whole or part

are intimately dependent or associated with the existence of an underlying dyscrasia, to which we have ventured to give the name of

THE STATUS SEBORRHÆICUS.

(3) There is considerable clinical and therapeutic evidence to suggest that all patients with the status seborrhœicus are suffering from a relative acidosis. We are of opinion that this condition may have resulted from a diminution of the intake in their food of the fixed bases—the mono- and di-sodium phosphates, and the carbonates, which are normally present in fresh fruits and vegetables and which are largely responsible for the maintenance of an exact alkaline-acid equilibrium in the blood and tissue fluids.

(4) As a practical outcome of these considerations there is abundance clinical evidence of the value of alkalies in the treatment of seborrhœic eczema.

PRELIMINARY REPORT CONCERNING THE EXAMINATION
OF 3,277 PATIENTS FOR THE *ENTAMÆBA HISTOLYTICA*,
AND TREATMENT OF 284 CARRIERS WITH BISMUTH
EMETINE IODIDE, ALSO SPECIAL NOTES WITH
REFERENCE TO THE CARRIERS OF SMALL CYSTS.

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AND

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THE microscopical examination of the faecal specimens of dysentery patients was undertaken at this hospital at the beginning of September, 1916, and the total number of patients examined up to December 31, 1917, was 3,277, of whom 504 (15·4 per cent) were found to be carriers of *Entamæba histolytica*.

For the purpose of giving a detailed account of the result of treatment and final disposal of a given number of such cases, a table has been prepared showing the result of examinations, treatment and ultimate disposal of the cases admitted from September 1, 1916, to August 31, 1917.

METHOD EMPLOYED IN TAKING FÆCAL SPECIMENS.

Patients are given a one-grain calomel tabloid the night before the test is taken, and in cases of marked constipation a saline is given in the morning.

In order to avoid the possibility of substitution of specimens by patients, a system has been introduced by which, after a patient has had a positive test, his following tests are taken under observation.

Practically all the patients examined at this Hospital are convalescent, with the exception of a few acute cases and relapsing cases. Some cases admitted as typhoid or paratyphoid have also proved to be amœbic carriers.

TECHNIQUE.

For the examination of the specimens normal saline and Weigert's solution (diluted) are used.

We make it a practice in doubtful cases for the film to be examined by both of us, and if we are unable to come to a decision, the report is deferred, and another specimen demanded.

We have recently used a solution of 1 in 10,000 neutral red in normal saline (as suggested by Professor H. R. Dean, of Manchester) in order to make a differential diagnosis between the amœba of *E. histolytica* and

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E. coli, but at present we should ~~hesitate~~ to pronounce definitely as regards the value of this method.

The number of routine specimens examined is only two for patients giving negative results, in accordance with the Army Council Instructions. Four consecutive negative tests are, however, obtained in the case of men found positive here or admitted as histolytica carriers. A test is taken if possible every seven days. At times, however, the interval between the tests is longer owing to the number of patients in the hospital. It should be noted that all patients admitted to this hospital belong to the "enteritis" group.

INCIDENCE OF INFECTION.

Table A.—Return showing results of protozoological tests in the case of all men convalescent after dysentery admitted from September 1, 1916, to December 31, 1917.

(1) The number of individuals examined was 3,277 and amœbæ or cysts have been found as follows:—

<i>E. histolytica</i>	..	..	in 504 cases	..	15·4 per cent of the number examined
<i>E. coli</i>	..	..	„ 638	..	19·5 „ „ „ „
<i>Giardia (Lamblia intestinalis)</i>	..	..	„ 342	..	10·4 „ „ „ „
<i>E. nana</i>	..	..	„ 86	..	2·6 „ „ „ „
<i>Chilomastix (Tetramitus mesnili)</i>	..	..	„ 88	..	2·7 „ „ „ „
"I bodies" (the "iodine cysts" of Wenyon)	..	..	„ 77	..	2·3 „ „ „ „
Trichomonas in one or two cases.					

The above percentages are somewhat low in comparison with the findings of other observers, but it should be remembered that they are based, in a considerable number of cases, on two examinations only.

(2) The 3,277 men were invalided from the following Forces:—

Number of admissions from French Force	..	..	2,249	..	—
Number of carriers of <i>E. histolytica</i>	..	..	257	..	11·4 per cent
Number of admissions from other Forces (Salonica, Mesopotamia, East Africa, etc.)	..	..	1,028	..	—
Number of carriers of <i>E. histolytica</i>	..	..	247	..	24·0 per cent

(3) Result of inquiry respecting past history concerning residence in the "East" or "Tropics" in the cases of the 504 men found to be carriers of *E. histolytica*:—

Patients who have been to the East or Tropics	..	329	..	65·3 per cent
Patients who have not been to the East or Tropics	..	112	..	22·2 „
No information available	..	63	..	12·5 „
		504		

Table B.—Return showing results of protozoological tests and final disposal in the case of all men convalescent after dysentery admitted from September 1, 1916, to August 31, 1917.

(1) The number of individuals examined was 2,318, and amœbæ or cysts have been found as follows;—

<i>E. histolytica</i>	..	..	in 366 cases	..	15.8 per cent of the number examined
<i>E. coli</i>	..	..	462	..	19.9 " " " "
<i>Giardia (L. intestinalis)</i>	..	..	249	..	10.7 " " " "
<i>E. nana</i>	..	..	62	..	2.7 " " " "
<i>Chilomastix (T. mesnili)</i>	..	..	77	..	3.3 " " " "
"I. bodies" (the "iodine cysts" of Wenyon)	..	..	67	..	2.9 " " " "
Trichomonas in one or two cases.					

(2) The 2,318 men were invalided from the following Forces :—

Number of admissions from French Force	..	..	1,443
" " carriers of <i>E. histolytica</i>	..	..	152 (10.5 per cent)
" " admissions from other Forces (Salonica, Mesopotamia, East Africa, etc.)	..	..	875
" " carriers of <i>E. histolytica</i>	..	..	214 (24.5 per cent)

(3) The 366 cases found to be carriers of *E. histolytica* were diagnosed on admission to Addington as follows :—

Dysentery	..	..	..	175
" (amœbic)	..	..	..	133
" (bacillary)	..	..	..	49
Typhoid, paratyphoid "A" or "B"	..	..	..	9
				<hr/> 366

(4) Result of inquiry respecting past history concerning residence in the "East" or "Tropics" in the cases of the 366 men found to be carriers of *E. histolytica* :—

Patients who have been to the East or Tropics	..	..	254 (69.4 per cent.)
" " not been to the East or Tropics	..	..	49 (13.4 ")
No information available	..	..	63 (17.2 ")
			<hr/> 366

(5) Return showing disposal of the 366 carriers of *E. histolytica* :—

"Cleared up" without treatment	..	..	..	67
" after one course of bismuth emetine iodine	..	..	..	163
" after two courses of " " "	..	..	..	41
" after three courses of " " "	..	..	..	11
Total number who "cleared up" (with a few exceptions, these men were transferred to Barton-on-Sea)	..	..	..	<hr/>282 (77 per cent.)
Discharged to III. Employments after two courses of bismuth emetine iodide	..	..	..	17
Discharged to III. Employments after three courses of bismuth emetine iodide	..	..	..	43
Discharged to civil life	..	..	..	2
Transferred to other hospitals	21
Died	1
Total number who have not "cleared up"	<hr/> 84
				<hr/> 366

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TREATMENT OF CARRIERS OF *E. histolytica*.

Table C.—The patients undergoing treatment for this condition are given bismuth emetine iodide in three-grain doses daily for eleven days. At first the drug was given in gelatine capsules, but owing to its unpleasant effects some of the patients attempted to evade taking them by secreting them under the tongue, behind the teeth, etc., so it is now given in the form of a mixture. The maximum number of courses given is three, after which patients who are still carriers are discharged to III. Employments. In the case of a man who has had treatment, the first test is taken after an interval of fourteen days from the date of termination of the treatment, and three further tests are taken at intervals of not less than seven days between each. Not less than thirty-five days relapse, therefore, between the termination of the treatment and the final test.

Return showing results obtained from bismuth emetine iodide treatment in the cases of men admitted from September 1, 1916, to August 31, 1917:—

Number who had treatment	..	..	284
"Cleared up" after one course	..	..	163 (57·4 per cent)
" " " two courses	..	..	204 (71·8 ")
" " " three courses	..	..	215 (75·7 ")

DETAILS OF RESULTS OF EACH COURSE.

First Course.

Had treatment	..	..	..	..	284
"Cleared up"	..	..	..	..	163 (57·4 per cent)
Relapsed	..	..	..	..	119 (41·9 ")
Transferred to other hospitals with tests incomplete					2

Second Course.

Had treatment	..	..	..	..	116
"Cleared up"	..	..	..	..	41 (35·3 per cent)
Relapsed	..	..	..	..	75 (64·7 ")

Third Course.

Had treatment	..	..	..	..	57
"Cleared up"	..	..	..	..	11 (19·3 per cent)
Relapsed	..	..	..	..	46 (80·7 ")

Table D.—Notification has been received to the effect that a number of the cases transferred to Barton-on-Sea as "clear" have been positive on examination there.

The following statistics refer to cases transferred to Barton during the months of March, June, July, October and November, 1917, only:—

	Number of cases transferred to Barton-on-Sea	Number of cases found positive at Barton-on-Sea
Cases admitted without any previous record of amœbic dysentery. These had two negative tests at Addington	770	36 (4·7 per cent)
Cases admitted as amœbic dysentery. These had four negative tests at Addington	39	6 (15·4 „)
Cases found positive at Addington but cleared up without treatment. (Four consecutive negative tests were taken in each case)	28	1 (3·6 „)
Cases found positive at Addington and had bismuth emetine iodide treatment and transferred to Barton as clear	97	6 (6·2 „)
Totals	932	49 (5·3 „)

Table E.—COMPARISON OF THE RELATIVE NUMBERS OF HISTOLYTICA CARRIERS OF LARGE AND SMALL CYSTS.

We have classed as small cysts those measuring less than ten microns in diameter. For the comparative morphology of the small variety of *Entamœba histolytica* cysts, and those of *Entamœba nana* and *Chilomastix*, see Dobell and Jepps, *British Medical Journal*, May 12, 1917, page 607.

(1) Three hundred and thirty-two new carriers of *E. histolytica* were found from May 1, 1917, to February 11, 1918; these were divided into the following groups:—

Carriers of large cysts (or amœbæ)	213 (64·2 per cent).
„ small cysts (or amœbæ)	95 (23·6 „)
„ large and small cysts (or amœbæ)	24 (7·2 „)
	332

(2) Result of inquiry respecting past history concerning residence in the “East” or “Tropics” in the cases of the 332 men found to be carriers of *E. histolytica*.

	Yes	No	Doubtful
Carriers of large cysts (or amœbæ) ..	134 (62·9 per cent)	71 (33·3 per cent)	8 (3·8 per cent)
„ small cysts (or amœbæ) ..	50 (52·6 „)	37* (39 „)	8 (8·4 „)
„ large and small cysts (or amœbæ)	10 (41·7 „)	13 (54·1 „)	1 (4·2 „)
Totals	194	121	17

* Including one man who has never been out of England, but who probably contracted the infection while employed unloading transports at Southampton Docks.

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(4) Disposal of the 332 carriers :—

	Large cysts	Small cysts	Large and small cysts	Total
"Cleared up" ..	107 (50.2 per cent)	79 (83.2 per cent)	12 (50.0 per cent)	198 (59.6 per cent)
"Chronic carriers"	88 (41.3 ")	14 (14.7 ")	11 (45.8 ")	113 (34.1 per cent)
Transferred to other hospitals, etc.	14 (6.6 ")	2 (2.1 ")	1 (4.2 ")	17 (5.1 per cent)
Still at Addington (tests incomplete)	4 (1.9 ")	—	—	4 (1.2 per cent)
	213	95	24	332

(5) Details of each course of bismuth emetine iodide treatment :—

	Large cysts	Small cysts	Large and small cysts	Total
<i>First Course—</i>				
Had treatment ..	194	89	23	306
"Cleared up" ..	78 (40.2 per cent)	66 (74.2 per cent)	9 (39.1 per cent)	153 (50 per cent)
Relapsed.. ..	114 (58.7 ")	23 (25.8 ")	14 (60.9 ")	151 (49.4 ")
Tests incomplete	2 (1.1 ")	—	—	2 (6 ")
<i>Second Course—</i>				
Had treatment ..	108	23	14	145
"Cleared up" ..	18 (16.6 per cent)	8 (34.8 per cent)	3 (21.4 per cent)	29 (20 per cent)
Relapsed.. ..	90 (83.4 ")	15 (65.2 ")	11 (78.6 ")	116 (80 ")
<i>Third Course—</i>				
Had treatment ..	79	10	6	95
"Cleared up" ..	7 (8.8 per cent)	1 (10 per cent)	—	8 (8.4 per cent)
Relapsed.. ..	70 (88.6 ")	9 (90 ")	6 (100 per cent)	85 (89.5 ")
Tests incomplete	2 (2.6 ")	—	—	2 (2.1 ")

THE VALUE OF INTRAMUSCULAR INJECTION OF QUININE IN THE TREATMENT OF MACEDONIAN MALARIA, AND SOME CONJECTURES CONCERNING QUININE THERAPY IN GENERAL.

BY MAJOR H. W. WILTSHIRE.

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(I) THE VALUE OF INTRAMUSCULAR INJECTION OF QUININE IN THE TREATMENT OF MACEDONIAN MALARIA.

THE three main methods of giving quinine in malaria are: by intravenous injection, by intramuscular injection, and by the mouth. Of these, it is generally allowed that intravenous injection produces the most powerful action against the parasites; but in practice its use is limited by a technique which is difficult to carry out except in hospital, and by the occurrence of serious symptoms, or even death, in certain cases.

These limitations do not apply in the case of intramuscular injection or oral administration, both of which are suitable for wide routine use. In consequence, the present dispute concerning the relative value of these two methods is of great importance to those who have to treat cases of malaria in large numbers.

In a recent article David Thomson [1] states his belief in oral quinine, and indicates his dislike of routine intramuscular injection, as is shown by the following: "As a general rule quinine injections are no more potent than when the quinine is given orally." "In ordinary straightforward and early cases the oral administration is the best." Holding this opinion, he would limit the use of intramuscular injection to: "cases suffering from coma and persistent vomiting, when oral administration is out of the question," and "all cases which appear to resist the routine quinine treatment by the mouth, or which relapse after this treatment." In effect he damns intramuscular injection with faint praise.

Twelve months' experience of treating the disease in Salonika had brought me so contrary an opinion that reading this caused intense surprise. A further five months of observation and attempt to reconsider the question with an open mind, only confirms me in thinking that quinine is vastly more efficacious when injected into muscle than when given by the mouth, and leaves me one of Thomson's "more or less scattered school of injectionists."

In this article I refer only to the malaria of Macedonia, having no experience of any other geographical variety; but, since the Macedonian malaria now bears an evil reputation in respect of severity of type and resistance to treatment, it is admirably suited for testing different therapeutic measures. All my cases have been treated in the Salonika district,

the majority being of the malignant variety, and many in the primary attack.

Patients treated by intramuscular injection now usually receive doses of twenty grains twice daily for four days. On the fifth day, treatment is continued by the mouth, most patients receiving thirty grains a day for a further period of three weeks at least. The difference between cases treated by oral quinine and those treated by intramuscular injection, is that, in the latter, doses given by injection have taken the place of a certain number of doses by the mouth. A fifty per cent solution of quinine bihydrochloride is used for injection. This is sterilized in an autoclave three days in succession before issue, and again every morning when in use. Repeated heating has not appeared to detract from the therapeutic value of the solution.

Patients treated by the mouth have received quinine sulphate or quinine bihydrochloride in various doses up to sixty grains daily, these always being given in solution.

Although ease of administration would always lead one to prefer the oral route, the possible objections to intramuscular injection are too trivial to count against a better therapeutic result. The pain at the moment of injection is slight, and the danger of sepsis is excluded by correct application of a simple technique. Symptoms of cinchonism are, if anything, more marked after oral administration than after injection. I have never seen intramuscular injection in the doses mentioned cause the slightest deleterious action upon the heart.

The clinical points which have led to an opinion in favour of intramuscular as compared with oral quinine may be considered under three headings.

(1) *Prognosis of Life.*

It is impossible to treat the malignant tertian malaria of this country without becoming rapidly and forcibly impressed by the sudden catastrophes which may occur in patients supposed to be well under the influence of oral quinine, and which render prognosis of life unsafe until a certain condition of treatment is reached. Except in the case of patients already in a critical condition at the time treatment is started, my experience indicates that this safety point is reached after the second dose of intramuscular quinine has been given. Unfortunately the same cannot be said for oral administration which, in some cases, has been found powerless to prevent these acute exacerbations of the disease. Sudden coma has occurred in patients who have taken thirty grains of quinine daily for days, and appeared to be absorbing it well, and even in patients who had apparently become convalescent on oral treatment.

It is probable that intramuscular injection gives greater security owing to a stronger action against parasites in the internal tissues, but whether this explanation be true or false, it is certain that injected quinine ensures life in a way oral quinine quite fails to do.

(2) *The Effect produced during the Acute Stage of Malaria.*

In addition to safeguarding life, we have found here that intramuscular quinine reduces fever, and alleviates symptoms far more surely, and on the whole far more quickly, than the same dose given by the mouth. This statement holds good, not only for cases of clogged liver and persistent vomiting in which oral quinine does not stand a fair chance, but also for those in which alimentary absorption appears good.

Failure to stop fever by oral quinine has not permitted a definite diagnostic conclusion, even when large doses were given; but similar failure on the part of intramuscular injection has proved a sure sign of the presence of some secondary disease, such as paratyphoid fever.

Hæmatological evidence agrees with this statement of clinical difference, for Captain W. L. Millar, who has carried out most of the blood examinations in this hospital, considers that the parasites are exterminated from the blood more quickly by intramuscular injection than by oral administration.

In the acute stage of malaria, then, intramuscular quinine may be relied on to produce a rapid and unfailing effect, whereas with oral quinine the effect is less rapid, and, since failures occur, unreliable.

(3) *The Chance of effecting a True Cure of the Disease.*

The great obstacle in trying to effect a true cure of malaria is the persistence of living parasites in tissues such as the spleen and bone marrow, in which, for some unknown reason, they gain a comparative immunity to quinine. But for this fact, every case of malaria could be cured in a week, since it is easy to clear the circulating blood of parasites; and the disease would be stamped out because carriers would cease to exist.

In the early stages, while they are invading these protecting tissues, the parasites can be killed by energetic quinine treatment, but the process of extermination becomes increasingly difficult as time goes on, and they become more and more firmly established. Hence the happenings in the spleen and bone marrow deserve more thought in treatment than is usually allotted to them.

James [2] states that: "Parasites, though perhaps absent from the peripheral blood at death, are found most frequently in the spleen and marrow after oral administration of quinine, less frequently after hypodermic injections, and with least frequency after three or four doses of 22·5 grains intravenously." The inference that intramuscular quinine is more lethal than oral quinine to spleen and marrow parasites is confirmed by two facts in our clinical experience here.

(a) *The Effect upon the Large Spleen of Chronic Malaria.*—Cases of chronic malaria with cachexia and splenic enlargement are now common here. In these the spleen often extends down to, or below, the level of the umbilicus, and is obviously an important focus of congregation of parasites. The cachexia, slight irregular fever, or definite relapses, from which these patients suffer, are obvious results of this chronic infection of the spleen.

Treatment by oral quinine usually leads to some improvement in general condition, but in some cases fails to alter the size of the spleen, prevent relapses, or stop slight irregular fever. In these a change to a four days' course of intramuscular quinine is almost invariably followed by marked shrinking of the spleen, and always by cessation of the slight fever, or an increased interval between relapses.

The distinction may be made, that whereas oral administration has merely produced some mitigation of the effects of infection, intramuscular injection has produced a definite attack on the infection itself, with correspondingly greater suppression of these effects.

(b) *The Prevention of Relapse.*—All the ordinary patients at this hospital have been Serbs, and so histories regarding primary attacks of malaria and relapses have not always been reliable, on account of difficulty with the language. Captain R. S. Barker gives me the following figures for the primary attacks and relapses which have occurred amongst our own personnel. Instances of possible re-infection, which would favour the intramuscular results, have been excluded; and it must be remembered that the cases treated by injection include all the more severe infections. Subsequent to injection, these patients received the same doses by the mouth as those treated by oral administration only.

(1) Received oral quinine only 128 cases, of which 56 relapsed, 43·7 per cent.

(2) Partial course of intramuscular quinine, 22 cases, of which 7 relapsed, 31·8 per cent (i.e., less than seven doses). Average four doses only.

(3) Proper course of intramuscular quinine, 18 cases, of which 1 relapsed, 5·5 per cent (i.e., seven or eight doses of twenty grains each).

Since relapse is proof that all the parasites have not been completely exterminated, these figures show that intramuscular quinine is better than oral quinine for effecting a true cure of the disease.

In this unit, then, our experience has been that quinine given by intramuscular injection is a much more potent remedy than quinine given by the mouth; because it improves the chance of life, produces stronger and more reliable action in both acute and chronic phases of the disease, and increases the chance of permanent cure. Any one of these reasons, taken by itself, would more than counterbalance the slightly greater difficulty of administration, and the trivial pain caused by the injection.

It is impossible to agree with David Thomson's opinion of the relative value of oral and intramuscular quinine, as applied to malaria of this country. Although as he remarks, the *therapia magna sterilisans* of Ehrlich is not yet feasible, he rightly insists upon the paramount importance of attacking the parasites at the earliest possible moment with all available force. Apart from intravenous injection of quinine, this would be better effected by intramuscular injections of twenty grains twice daily for four days, followed by thirty grains daily by the mouth for the next three weeks, than by his compromise routine treatment of—"thirty grains daily for

three weeks by the mouth—and in addition ten grains daily by injection during, say, the first five and the last five days of this treatment.”

(II) CONJECTURES CONCERNING QUININE THERAPY IN GENERAL.

Although the peculiarities of Macedonian malaria may be concerned in the success of intramuscular quinine in treatment, they will not explain away the fact that oral administration leads to a greater and quicker excretion of quinine in the urine. This point seems soundly established since all investigators are agreed upon it; and, further, it seems certain that the amount of quinine excreted as such by channels other than the kidneys, is insignificant.

Mariani's averages, quoted by MacGilchrist [3], show the amounts of quinine excreted in the urine after the various methods of administration to be as follows :—

After oral administration, 40·88 per cent; after intramuscular injection, 35·43 per cent; after intravenous injection, 27·94 per cent.

The first two figures have been used as an argument to prove that quinine is absorbed into the blood more quickly when swallowed than when injected into muscle. Extension of this argument could prove that more quinine could be introduced into the blood by oral administration than by intravenous injection, which is absurd. It is certain, therefore, as noted by MacGilchrist, that these excretion figures are not to be accounted for by simple rapidity of absorption, and it is necessary to search for another explanation.

The connexion between quinine excreted as such in the urine, quinine changed in the body, and anti-parasitic action in malaria, is worth noting and can be illustrated by a simple table.

			Excreted, unchanged		Changed in body		Anti-parasitic value	
Intravenous	+	..	+++	..	+++	
Intramuscular	++	..	++	..	++	
Oral	+++	..	+	..	+	

This shows that the therapeutic effect produced by quinine varies directly with the amount altered beyond recognition in the body, and inversely with the amount which is excreted unchanged in the urine, and affords basis for the following conjectures :—

(a) That the quinine which is excreted unchanged in the urine is inactive against the parasites, in fact, a therapeutic waste product washed out of the body in the urine.

(b) That the active anti-parasitic agent must be connected with the quinine which is altered in the body so that it cannot be recovered as such.

Hence the processes which partake in quinine conversion in the body are at least worthy of investigation, and may be found to deserve encouragement in treatment.

That this alteration is not solely due to destructive anti-alkaloidal

action on the part of the liver can be deduced from the fact that quinine destruction is least when the drug is taken by the mouth.

There are good reasons for believing that part of the quinine introduced into blood, lymph, and tissues becomes rapidly combined with proteid, and this combination or building up may well be a first stage in the process of destruction.

MacGilchrist demonstrated this combination in the case of quinine added to blood serum *in vitro*, finding that strong solutions caused a definite coagulum, and weaker solutions a curdy precipitate or hazy appearance. The acid salts appeared to be most compatible with serum. "The deposit which forms *in vitro* on adding a concentrated solution of quinine salt to blood serum seems to contain quinine in altered form, oxidized and combined with proteid. Mixing equal volumes of blood serum and quinine hydrochloride 1 in 20, it is found that slightly over half the quinine is in solution, and slightly under half is contained in the deposit."

John D. Thomson [4] working with a twenty per cent solution of quinine bihydrochloride and using serum as the diluent, has obtained somewhat similar results. On microscopical examination he found that the opalescent appearance caused by dilution 1 in 10 and 1 in 20 was due to the presence of amorphous granules. With dilutions higher than 1 in 160 there was no change, the mixture remaining quite clear.

When the solutions of quinine bihydrochloride used in this unit for treatment are mixed with different volumes of human blood serum, they give the following results.

(A) Fifty per cent solution used for intramuscular injection. Equal parts: Clear coagulum almost at once. In forty minutes a slightly hazy clot giving the appearance of clear jelly under the microscope. 1 in 40: Marked milky precipitate at once. In forty minutes precipitate slightly increased, composed of fine granular particles, irregular in shape, but all smaller than red blood corpuscles. 1 in 80: As 1 in 40, but more dilute.

(B) Five per cent solution used for intravenous injection. Equal parts: Thick milky precipitate at once, composed of particles as above. Forty minutes later precipitate curdy owing to masses of fine particles sticking together. 1 in 40: Haze at once, due to particles as above. Unchanged after forty minutes. 1 in 80: Faint haze at once, unchanged after forty minutes, and due to thin emulsion of fine particles.

When equal parts of these intramuscular and intravenous solutions were mixed with blood serum containing red blood corpuscles in suspension, the immediate results were the same as with serum alone, but within thirty minutes most of the corpuscles had been destroyed, and the colour of the mixture had changed from red to clear brown owing to change in the hæmoglobin.

These experiments show that quinine in therapeutic solutions has a marked affinity for some proteid constituent of blood serum, and a similar affinity must exist for some of the proteid constituents of red blood corpuscles and tissue cells.

Barratt and Yorke (quoted by Castellani and Chalmers [5]), have shown that hæmolytic of red blood corpuscles occurs with quinine in alkaloidal form as well as with the bihydrochloride, and that hæmolytic power is nearly the same in equi-molecular concentration.

The changes produced by injection of strong solutions into tissues must be caused by a combination with cell proteid. Captain J. F. Gaskell has recently shown me a section which shows the result of a subcutaneous injection of quinine in the skin and underlying tissues. The surrounding reaction suggested that the injected part had acted as a simple foreign body, marked inflammation being absent. In the injected part all structures were shrunken, but though this shrinking resulted in obliteration of cell outlines, all nuclei were most conspicuous and stained with ease. Fat entangled in the shrunken tissue was contained in well-preserved fat cells, and stained normally. The dermal fibrous tissue besides being shrunken showed change in staining reaction indicative of altered constitution. Captain Gaskell considers these changes most suggestive of a very stable and permanent combination of quinine with the proteids of the cells and structures concerned.

It is probable that such combination with cell proteids will vary in degree and in kind, with the type of cell concerned, the flushing of the part with blood or lymph, and the concentration of quinine injected. As an example of such variation on the part of cells we have only to consider the relative immunity of muscle compared to fat and subcutaneous tissue, or the immunity of other pathogenic protozoa with the susceptibility of the malaria parasite.

Of the nature of these quinine proteid combinations we know little. MacGilchrist suggests that the combination with proteid of blood serum holds the quinine in an altered and oxidized form, but capable of liberation, the compound being unstable. The comparative slowness with which quinine is excreted in the urine after intravenous and intramuscular injections might be accounted for by such temporary combination, or by the gradual solution of quinine which had been precipitated as such at the time of injection. The absence of microscopical crystals in the coagulum formed by strong solutions with serum is in favour of the unstable proteid compound. The persistence of coagulation in tissue cells suggests that a stable proteid compound has been formed in this case.

It is most probable that several different quinine proteid combinations can be formed. Some of these will be stable, and some unstable, and the relative quantities of each produced will vary with the types of proteid concerned, and the condition of concentration of quinine.

For the sake of argument in considering our different methods of administering quinine, we may assume that when it is introduced into the body one portion remains in simple solution, a second portion combines with proteid to form an unstable compound, and a third portion becomes firmly locked up in stable combination with proteid.

In the case of intravenous injection of solutions as used here (strength five per cent), or used by J. D. Thomson (strength twenty per cent), a large proportion of the quinine must become combined with proteid at once. Since the solution is given slowly and freely diluted with plasma as given the resulting colloid particles are small, but large in number, and are rapidly distributed over the body. It is probable that these are composed of unstable quinine proteid compound, for MacGilchrist was able to recover quinine from a deposit of this nature. The rapid and increasing dilution with plasma will enable some quinine to remain in simple solution and will militate against the formation of much stable quinine proteid combination.

The substances resulting from an intravenous injection may consequently be represented thus :—

Quinine in simple solution	..	..	..	..	+
Stable quinine proteid compound	..	..	..	..	+
Unstable " " "	..	..	..	..	++++

In intramuscular injection, a strong solution is introduced into the midst of fairly dense tissue where the movement of lymph fluid is comparatively slow, and immediate dilution very slight. Some of the quinine will combine with the proteids of muscle and connective tissue cells to form stable and unstable quinine proteid compounds. It is doubtful whether much becomes locked up in stable combination, because, according to MacGilchrist, Mariani using a 1 in 5 solution of quinine bihydrochloride found that 66·5 per cent could be recovered from rabbits' muscle seventeen hours after injection. The rest, being gradually carried away by lymph, will be comparable to an intravenous injection very slowly given, some remaining in solution, and some being converted into unstable quinine proteid compound. With the concentrated solution used here, the amount carried away in simple solution will be relatively small, for MacGilchrist quotes a table from Giemsa and Schaumann showing that the more concentrated the solution used for injection the less quinine is excreted in the urine.

The result of an intramuscular injection will be :—

Quinine in simple solution	..	..	..	..	+
Stable quinine proteid compound	..	..	..	..	++
Unstable " " "	..	..	..	..	+++

(part immobilized by tissue proteid for some time).

It is not yet settled whether quinine taken by the mouth is absorbed mainly from the stomach as the bihydrochloride or from the small intestine as a glycocholate; but, in whatever form it actually enters the blood-stream, the entry must be very gradual and take place in a state of dilution which may be considered extreme, when compared with intravenous or intramuscular injection. Less quinine will combine with plasma protein to form stable and unstable quinine proteid compounds, and more will remain in simple solution.

The assumption that slow gastro-intestinal absorption implies great dilution, and hence increase in the relative amount of quinine held in solution, is supported by Mariani's investigations, for he found that the total quinine elimination in the urine was greater after administering insoluble, than after administering soluble salts, and was also greater when the drug was given with a meal than when it was given fasting. Collateral support is afforded by the fact that a single dose of quinine leads to less being excreted in the urine than when the same quantity is divided into five doses given at intervals of two hours (Giemsa and Schaumann, quoted by MacGilchrist).

Consequently the result of a dose by the mouth will be:—

Quinine in simple solution	..	..	..	..	++++
Stable quinine proteid compound	..	..	..	..	+
Unstable " " "	..	..	..	..	+

Thus the amount of unstable quinine proteid compound which is formed in these three different methods of quinine administration, is found to be proportional to the respective therapeutic results which they produce.

Intravenous injection of strong solutions gives rise to a large amount of unstable quinine proteid compound, which is rapidly distributed over the body, and produces the most rapid and powerful anti-parasitic effect.

Intramuscular injection gives rise to a fairly large production of unstable proteid compound, dissemination of which is, however, comparatively slow. The anti-parasitic effect is correspondingly slow compared to intravenous injection, but it is certain and sure.

Oral administration results in a comparatively small production of unstable quinine proteid compound, so that, though dissemination over the body is rapid, the anti-parasitic effect is relatively small.

Hitherto this combination of quinine with proteid has been regarded as a nuisance, and a thing to be avoided; a reason for giving intravenous quinine in very dilute solution, and for giving up intramuscular injection altogether. The clinical results obtained by intramuscular injections, and by intravenous injections of relatively strong solutions, not only negative this view, but actually point to the conclusion that the anti-parasitic activity of quinine is dependent upon the drug reaching the parasites in this condition of unstable combination with proteid.

The toxic symptoms produced by quinine are of interest in this connexion, because, after allowing for the disturbing influence of individual idiosyncrasy to the drug on the part of some patients, the lack of relationship between cinchonism and anti-malarial effect still remains a puzzle.

On the whole, I believe that quinine given by intramuscular injections causes less toxic symptoms than the same dose given by the mouth, and the comparative freedom from these after intravenous injection is certainly startling.

These considerations, coupled with the figures of excretion in the urine

given above, are sufficiently striking to suggest that some of the symptoms of cinchonism must be produced by the quinine which circulates in simple solution, and not to the quinine circulating in combination with proteid. This suggestion is supported by MacGilchrist's minimal lethal dose experiments, for he found that the methods of administration could be placed in the following order as regards lethality.

- (1) Subcutaneous injection in extreme dilution (1 in 150).
- (2) Oral administration during fasting.
- (3) Oral administration with or soon after food.
- (4) Subcutaneous injection in strengths generally used for a hypodermic injection (1 in 2 and 1 in 8).

From this list it is seen that the methods of administration found to be most toxic were those which would lead to the greatest amount of the drug circulating in the blood in the state of simple solution. I do not know of any minimal lethal dose experiments dealing with intravenous injection, but one reason why comparatively concentrated solution is used for that purpose here, is, that injections of large quantities of dilute solutions were given a very bad reputation with regard to the production of serious symptoms or even death. It is also interesting to note that MacGilchrist found the hydrobromide of quinine, which is supposed to cause least cinchonism, to be the salt least compatible with ox serum.

In reality, we ought to expect some of the toxic symptoms produced by quinine to be due to unaltered quinine circulating in solution, because they must be caused by a combination of the drug with certain tissue cells, such as those of the brain or heart muscle. When a large amount is combined with plasma proteids directly it enters the blood a proportionately small amount is left free to combine with these cells. The plasma proteids in fact may act as an antitoxin in this respect, and are so plentiful that the combination of a small quantity leaves their total functional power to all intents intact.

The action of quinine molecules in the body, then, will depend upon the form in which they are circulating, and the type of cell against which their action is exerted. There are reasons for thinking that in the case of the malaria parasite they act best when contact is made in the form of an unstable combination with proteid, whereas in the case of certain tissue cells this action is greatest when contact is made in the state of simple solution.

(1) CONCLUSIONS.

In the treatment of the malaria of Macedonia intramuscular quinine has been found harmless, and much superior to oral administration in the following respects :—

- (a) It improves the prognosis of life.
- (b) It is more certain in action during the acute stage of the disease.
- (c) It adds greatly to the chance of effecting a true cure of the disease.

(2) CONJECTURES.

Consideration of the different methods of administration of quinine in respect of the therapeutic results attained, the amount of quinine excreted in the urine, the affinity of quinine for the proteids of blood and tissues, and the toxic effects produced, suggest that :—

(a) The real anti-parasitic agent is to be found in an unstable combination of quinine with a proteid of the blood plasma.

(b) That the quinine which circulates in the blood in simple solution and is excreted in the urine unchanged, may be regarded as a waste product, and is innocent of anti-parasitic effect.

(c) That some of the toxic effects produced by quinine on the body are due to the unchanged quinine which circulates in the blood in a state of simple solution.

Whether these conjectures are right or wrong can be settled by combined chemical and clinical investigation. Here it is only claimed that the subject is of sufficient importance to deserve this investigation by some one with the chemical knowledge which I lack, and the facilities provided by a laboratory equipped for pharmacological research.

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Clinical and other Notes.

A NOTE ON THE PROTOZOA OF THE INTESTINE.

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(Report to the Medical Research Committee, by Major H. R. Dean, R.A.M.C., T.F.)

THE following notes comprise a brief account of the intestinal parasites which have been met with in the routine examination of dysentery convalescents during the last fourteen months, together with a short description of the methods which have been found most useful for the recognition of *Entamoeba histolytica*, the detection of which has been the principal object of our work. The methods employed for the detection of this parasite fall under two headings:—

(a) Methods which aim at the detection of amœboid forms as well as cysts.

(b) Methods which rely entirely on the recognition of encysted forms.

If it is desired to detect the amœboid forms it is of course necessary to work with fresh preparations. As will be seen later, in about thirteen per cent of our cases amœboid forms were found, but no cysts, and important as is the recognition of cysts, it is impossible to neglect the examination for amœboid forms without introducing into the results a very appreciable error.

The following table shows the incidence of infection by protozoan parasites in a series of 153 cases examined during October and November, 1916. Two examinations were made in each case.

Number of cases	<i>E. histolytica</i>	<i>Lamblia intestinalis</i>	<i>E. coli</i>
153 ..	24.1 per cent ..	13 per cent ..	16.3 per cent

The percentage of cases infected with *E. histolytica* is higher than that recorded by other workers, a result which is probably due to the large number of cases in which amœboid forms only were found.

Cases in which cysts and amœbæ were found ..	10.4 per cent
Cases in which amœbæ only were found ..	13.7 ..

We attribute this result to the fact that the specimens were examined within a few hours of being collected, and to the use of neutral red saline as a medium for the emulsification of the fæces.

METHODS.

A purgative was administered the night before the examination was to be made. Specimens of fæces were put up in small tubes and sent with the least possible delay to the laboratory. The examination was carried out as soon as possible, as specimens of fæces more than six hours old are useless if it is desired to detect amœbic forms.

A solution of 2½ per cent iodine has been recommended by many workers for facilitating diagnosis. The nuclei of the cysts are most certainly made clearer by the solution, but the amœbæ are still difficult to differentiate from other cells lying in the fæces.

The method we have employed throughout our work is a slight modification

of one advocated by Stitt and others. This consists in the use of a $\frac{1}{2}$ per cent solution of neutral red, using saline as a solvent. The solution we have employed is more dilute, being but 1 in 10,000. The advantage of this method over others is that the endoplasm of *E. histolytica* takes up the neutral red, while that of *E. coli* usually refuses it, and is easily recognized by the pink colour. *E. coli* has on rare occasions reacted to the stain, but to such a slight extent that no difficulty arose. Any colour which was present in *E. coli* was confined to the edge of the vacuoles and was not uniformly distributed.

In confirmation of the validity of our method we have made permanent preparations, always with the result that the amœbæ suspected of being those of *histolytica* have proved to be so. As a fixative we have used Schaudinn's solution and stained with Heidenhain's iron hæmatoxylin.

The preparations were left in the fixative from ten to fifteen minutes, then thoroughly washed with thirty per cent iodine so as to remove any crystals of corrosive sublimate.

The slides were then put into $2\frac{1}{2}$ per cent iron alum for half an hour, washed, and finally stained by a two per cent solution of hæmatoxylin for twelve hours. This long period of staining is an advantage, because the chromatin is strongly affected and does not easily wash out during the process of differentiation with the iron alum. When sufficient colour has been extracted the slides were dehydrated and mounted in Canada balsam in the usual way.

DESCRIPTION OF PARASITES.

Entamœba coli.—This organism is the commonest inhabitant of the intestine and occurs frequently in both amœboid and encysted condition, though the former seems to be the phase of the life-history usually found. In the Medical Research Committee's report on amœbic dysentery, Dobell estimates that three-quarters of the cases investigated were infected by this parasite.

The amœbæ are very variable in size, ranging from small forms about 7 microns in diameter to large ones of 25 microns or more. The average size is about 15 microns. They are oval or round in shape and the ectoplasm is not sharply marked off from the endoplasm, indeed it is difficult to differentiate the two regions unless the animal is seen in the active condition when the ectoplasm can be observed in the pseudopodia.

Vacuoles are present in practically all cases; there may be a single large one or many small ones distributed throughout the endoplasm. Wenyon and others have described as a constant feature the presence of bacteria in the endoplasm, but our experience has been that these bodies are rare, the endoplasm usually appearing fairly homogeneous.

The nucleus measures from 5 to 8 microns and is excentric; it can usually be seen in the living animal. In stained preparations it is found to be rich in chromatin, the nuclear membrane is thick and upon the periphery there are situated chromatin granules. In the centre there is a fairly large karyosome. Great variability is found as regards the arrangement of the chromatin in the nucleus, often the condition is that described above, but frequently the karyosome is large and the peripheral granules few in number, the whole complex recalling the arrangement met with in the nucleus of *Amœba limax*. On occasion a large amœba may be observed, which from its size might be mistaken for that of

E. histolytica, except that there is no trace of the neutral red reaction. Investigation by staining will demonstrate, however, that there are eight nuclei in the cytoplasm. This form is a stage in the life-history when the animal is preparing to multiply by schizogony. The nucleus has divided into eight, and round each of these nuclei the cytoplasm will aggregate to form eight small amœbæ which will grow into adults. Intermediate conditions may also be seen with from two to eight nuclei in the body.

The encysted condition is also frequently encountered. The cysts are usually large, 10 to 20 microns, and contain eight nuclei, some of which can be seen in the unstained specimens; the cyst also appears to have a double contour. The shape is round or slightly oval, the former being the commoner.

Entamœba histolytica.—Under this head we include the species known as *Entamœba tetragena* and *Entamœba minuta*. The first is undoubtedly a stage in the life-history of *E. histolytica*; the second species we incline to regard as a further stage in the same life-history; though the figures given by some workers (Popoff, 1911) would seem to indicate that we were dealing with a stage in the life-history of *E. coli*. The percentage of cases infected with *E. histolytica* is given by Dobell as probably from eighteen to twenty-five per cent.

The amœbæ are easily distinguished by means of the neutral red stain; they are variable in size, ranging from small forms of 7 microns to large ones of 30 microns or even larger, on the average the size is greater than that of *E. coli*. The ectoplasm is also sharply marked off from the endoplasm as an unstained hyaline substance. Vacuoles are uncommon though they may occur; when present, however, they are small. Inside the endoplasm there are numerous particles and bacteria; blood corpuscles may also be found. Great stress is sometimes laid upon the presence of these last mentioned bodies and some workers go so far as to refuse to diagnose *E. histolytica* unless they are seen. Our experience has been that blood corpuscles are by no means so common as is supposed, and if we relied upon them as a means of differentiation our percentage of positive results would have been much smaller. Perhaps the fact that the cases we have examined have been convalescent has a good deal to do with the relative absence of ingested blood corpuscles.

The nucleus, unlike that of *E. coli*, is not visible in the living animal; when stained it is found to be excentric in position, sometimes pressed against the periphery of the endoplasm. It is by no means so regular in shape as is that of *E. coli*. A further point of difference is the scanty amount of chromatin which it contains, represented by small peripheral granules on the thin nuclear membrane. A small ventricle can often be observed lying in the middle of the nucleus. The encysted stage of the life-history was formerly thought to be part of the life-history of another species of amœba, *E. tetragena*. The size of the cysts varies from 10 to 18 microns; they are smaller than those of *E. coli*. Also the nuclei, which are four in number, are not seen in an unstained preparation, which is in contrast with the visible nuclei of *E. coli* cysts. Lying in the endoplasm of the histolytica cyst is a peculiar body, thought to be of chromidial origin, and known as the chromatin block. Two or more of these bodies are often present in one cyst, and as it is possible by careful focusing to observe them in the unstained condition they are of great use in differentiating between the cysts of this species and *E. coli* amœbæ, which they superficially resemble in fresh

preparations. Our experience is that it is more easy to confuse these two conditions than any others and it has been our habit, whenever there was any doubt, to make stained preparations which at once settled the question.

Bodies resembling the chromidial blocks have been recorded from time to time as occurring in the cysts of *E. coli*, indeed we have ourselves found them on one occasion, but as eight nuclei were also visible there was no doubt as to the species of animal with which we were dealing.

Lambia intestinalis (*Giardia intestinalis*). *L. intestinalis* or *G. intestinalis* as this parasite should be called, is perhaps the most characteristic of all infections. This flagellate, rarely seen in the active condition, is pear-shaped, 12 to 18 microns long, with two large nuclei at the anterior end and four pairs of flagella, which spring from two supporting rods or axostyles running down the middle of the body. Near the nuclei are two suckers by means of which the animal attaches itself to the epithelial lining of the intestine. The form in which the parasite is usually seen in the fæces is the encysted one and according to Dobell's recent report more than one-third of the patients examined were infected.

The cysts are oval, measuring about 14 microns by 7 microns, though occasionally round forms may be seen. In all cases, however, the axostyles are visible as light lines running down the longitudinal axis of the cyst. Four nuclei are situated at the anterior end.

Macrostoma mesnili (*Tetramitus mesnili*).—This small flagellate is easily recognized when in the active condition by the rapidity of its movements. The body generally is pear-shaped, measuring about 12 microns along its longitudinal axis. Small round forms of about 5 microns are, however, often encountered.

At the anterior end there arise from a small basal granule three flagella which produce in preparations of the living parasite the appearance of a single whip. A longitudinal split, the cytosome, is seen at the anterior end as a light band, and inside this groove a small flagellum is found which appears to be attached to the body by an undulating membrane. No axostyle is developed in this species of flagellate.

The endoplasm has many vacuoles, which take up the neutral red stain. The cysts are small and very refractile, they are rounded in shape and measure 7 to 8 microns. The cytosome can in most cases be seen. Of the other parasites infecting the human intestines little need be said because of their comparative rarity, they are also well described by Wenyon.

Trichomonas intestinalis is very similar to macrostoma and of about the same size and shape. It differs, however, in the possession of an undulating membrane running the whole length of the body, and of an axostyle. The cytosome in this form is very small. *Cercomonas crassicauda* is a flagellate with a single flagellum at the anterior end, the posterior one often being drawn out into long tail-like processes. Besides these animals coccidian cysts and the eggs of a parasite worm, *Trichocephalus dispar*, may be seen on rare occasions.

It is interesting to note that the ciliates, *Balantidium coli* and *Nyctotherus faba*, have not as yet been recorded from dysentery patients examined in the hospitals in this country. In every specimen of fæces examined the cysts of vegetable organisms, together with yeasts, etc., are met with. One of the commonest is *Blastocystis hominis*; superficially it seems to resemble a small

E. coli amœba, but it has a much flattened appearance and an enormous vacuole, the protoplasm appearing as a thin peripheral band. Epithelial cells and undigested vegetable matter abound, but no confusion should arise between these structures and the parasites already described above.

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A SHORT NOTE ON CERVICAL LAMINECTOMIES, WITH AN ILLUSTRATIVE CASE.

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THE number of cases of gunshot and shell wounds involving the spine, which are operated on at a Casualty Clearing Station, is extremely small. Many of them, notably those with paraplegia, are often considered to be hopeless, and indeed there are, as a rule, other cases waiting attention, in which operative interference would be more justifiable. In short, it is a disagreeable fact that in many cases of spinal injury operation is a useless waste of time and energy. There are cases, however, carefully selected, in which an operation should be considered. The deciding factors may be:—

- (1) Incomplete paralysis.
- (2) Accessibility of the missile.
- (3) Pain.

Incomplete paralysis or paresis determined by a thorough examination of the case in question justifies a more favourable prognosis.

Accessibility of the missile discoverable by X-ray examination would indicate surgical interference. Pain, due to pressure on nerve roots, may be so severe as to justify an operation on humanitarian grounds alone, and a combination of all three or any two of the above reasons ought to remove all doubts from the surgeon's mind as to operation.

It may be a debatable point whether cases of spinal injury should be operated on at a Clearing Station or whether the operation should be delayed until the patient reaches a Base Hospital. It is certainly beyond question that if there is pressure on the cord by bone fragments or missile, the sooner that pressure is removed the more hopeful will be the outlook. If the pressure is not relieved, permanent changes will take place in the cord, and the hopes of recovery become reduced to a minimum. Should a missile be lodged, to delay the operation may be to invite the advent of sepsis, a very grave danger to the life of the patient from spinal meningitis or myelitis.

In a reasonably hopeful case after due consideration of all the questions at issue, it seems that if an operation is to take place it should be performed at the Clearing Station. A writer has already pointed out that spinal cases travel as well, if not better, after operation than before, and cases can usually be detained until fit for transit.

Before proceeding to undertake the operation, it is advisable to have an X-ray examination (this can be carried out at most Clearing Stations). Some surgeons demand a lateral in addition to an antero-posterior skiagram, but it is quite possible to obtain a satisfactory localization with antero-posterior views and accurate measurements made in relation to bony points.

Retention of urine presents a difficulty to the surgeon demanding time and patience, and which is apt to be somewhat trying, when so many cases have to be dealt with. The risks of cystitis and an ascending infection are well known, though perhaps not always fully realized. Two s'e are to be considered—namely, six-hourly catheterization and suprapubic cystotomy. Catheterization risks may be considered over-rated by some surgeons, and suprapubic cystotomy believed to be too drastic, but when one appreciates the conditions that require the transference of the patient from one hospital to another, and the difficulties of passing catheters when on an ambulance train, it would seem wise, if not expedient, to perform a suprapubic cystotomy at the Clearing Station.

Thomson Walker, an authority on genito-urinary surgery, recommends the adoption of such a procedure as early as possible.

The following case of cervical laminectomy is not without interest.

The patient, M., received a shell wound in the neck posteriorly, quarter of an inch to right side of the middle line on a level with the interval between the third and fourth cervical spines. There was no exit wound. Wounded some ten hours before examination, the patient had paralysis of both upper limbs and the right leg. The upper arms were abducted from the sides, flexed at the elbows, and hands were in the supine position with the fingers semiflexed. All reflexes were absent in the arms and right leg. Voluntary movement was present in the left lower limb. Severe pain in both arms was complained of, especially in the region of the left shoulder. No other sensory disturbances were present. The bladder was markedly distended. There were no changes in the pupils, and no recession of the eyeballs. X-ray examination showed the shell fragment lying against the right lamina of the fourth cervical vertebra. It was localized by relation to bone and found to be one inch deep to the spine of the fifth cervical vertebra. The bladder was evacuated by passing a No. 8 silver catheter, a metal instrument being used because of the presence of an old stricture in front of the triangular ligament. Warm ether vapour was administered, and a six-inch incision made in the middle line. Cutting down on the cervical spines, the muscles were separated on the right side between the laminae and the spines, and retracted outwards. The spines of the third, fourth and fifth vertebræ were removed by bone-cutting forceps. A probe passed into the entrance wound formed a useful guide in the operation, and the fragment was easily traced and removed. The right lamina depressed to the extent of roughly a quarter of an inch was shattered and removed by bone forceps. The dural membrane was found to be intact, and little or no blood seen in its neighbourhood. After irrigating the wound cavity with eusol, the wound was almost completely closed with catgut and S.W.G. sutures, leaving

a small light eusol gauze patch in the wound and a Carrel tube. The original entrance wound was excised and a Carrel tube inserted into the tract. Two days later there was slight voluntary flexion of the toes of the right foot, followed twenty-four hours later by some movement in the arms, and the presence of a mild knee-jerk on the right side. Six days after the operation, the Carrel tubes were removed, and two days later the wound was closed by three S.W.G. stitches. Voluntary movement improved daily, and before the patient was evacuated to the Base he could raise both arms to his temples, and could flex the right knee to nearly a right angle. The relief from the excruciating pain referred to the left shoulder was rapid and gratifying. A suprapubic cystotomy was not performed. The metal catheter was left in situ for three days, to dilate the stricture, then six-hourly catheterization was carried out until some control over the bladder was established.

One is now convinced that it would have been wiser to drain the bladder suprapubically in order to avoid the danger of cystitis and to overcome the difficulties of catheterization in the presence of a stricture.

A PRELIMINARY REPORT ON THE ICE-BOX METHOD OF PERFORMING THE WASSERMANN REACTION.

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In recent years accurate titrations of the reagents employed in the Wassermann reaction and the utilization of various non-specific lipoidal antigens have led to several undoubted improvements on the original Wassermann technique. The diversity of methods adopted has unfortunately produced an inability to correlate and compare the results of numerous competent immunologists. The special Committee, appointed by the Medical Research Committee, for the standardization of pathological methods [1] has helped considerably in overcoming this difficulty by advocating the adoption of one of three standard methods. As modern statistics, including those collected by the Research Committee [2], still show that a proportion of early primary, of late tertiary, and of latent syphilis yield negative Wassermann reactions, it would appear that in such cases still more sensitive methods are needed to detect the smaller quantities of immune body or lipotropic substance present in the peripheral blood.

In the present report an analysis is made of an investigation of 1,302 cases.

¹ Staff-Serjt. Sullivan died from the effects of malaria contracted in the Jordan Valley. He was a keen scientific worker and had acquired a very considerable knowledge of immunology.

A slight modification of Harrison's technique [3] has been adopted and a comparison is made between the results obtained by the ordinary and the ice-box methods of conducting the Wassermann reaction.

THE RATIONALE OF THE ICE-BOX METHOD.

The fundamental difference in the ice-box method is that in the first stage the system composed of antigen, complement and suspected luetic serum, is placed in the ice-box at 8° C. for a period of from three to twenty-four hours instead of the customary incubation of one hour at 37° C. Recorded observations to determine the "optimum temperature" for conducting the first stage of the reaction are comparatively few in number. Satta and Donati [4] state that complement is absorbed at 0° C. but perhaps more slowly than at 37° C. Jacobsthal and also Guggenheimer [5] found that in some sera more complement is absorbed at 0° C. than at 37° C. Thompson and Boas [6] state that binding never occurs better at 0° C. than at room temperature, but that in the majority of cases the reaction took place better at room temperature (or at 0° C.) than at 37° C. Harrison's observations corroborate those of Boas and in practice both conduct the first stage (of one hour) for thirty minutes at 37° C. and thirty minutes room temperature.

In our opinion, however, the rationale of the method is dependent not so much on conducting the reaction at an optimum temperature as on increasing the *time* available for the reaction. The effect of low temperatures in increasing the thermostability of complement, without *pari passu* decreasing the power of syphilitic immune-body or lipotropic substance to unite with complement and antigen, enables this stage of the reaction to be conducted over a period of time that would be quite unsafe at 37° C.

Statistical observations on the ice-box method appear to have been exclusively made in America and have been reported on favourably by Archibald McNeil [7] in 1912, by Zinsser [8] in 1916, and by Wheeler Smith and W. J. MacNeal [9] in two papers appearing in 1916 and 1917 respectively.

EXPERIMENTAL DATA FAVOURING THE METHOD.

If the ice-box method is to be considered a technically sound procedure certain experimental conditions must be fulfilled. In a series of preliminary experiments we have investigated the effects of temperatures of 8° C. and 37° C. on certain serological reactions.

The conclusions reached are as follows :—

(1) In complement¹ stored at 8° C. no deterioration could be detected even after twenty-four hours or longer. On the contrary the complement of certain guinea-pigs when stored at 37° C. showed deterioration within three hours.

(2) The complement absorbing power of a mixture of *pooled* syphilitic serum and antigen was found to be much greater when the reaction was conducted for six hours at 8° C. than for one hour at 37° C. In a series of observations the excess of complement absorbed by the ice-box method over and above that

¹ The complement in all these experiments was obtained from guinea pigs and stood in contact with clot for six hours at 8° C. before being used.

absorbed by the ordinary method was 2 M.H.D.'s for primary syphilis, 5 M.H.D.'s for secondary syphilis, 6 M.H.D.'s for tertiary syphilis, and 5 M.H.D.'s for treated relapsing syphilis.

(3) The complement absorbing power of the mixture of pooled *negative* serum and antigen was never more than $\frac{1}{2}$ a M.H.D. greater when the reaction was conducted at 8° C. for six hours than when it was conducted for one hour at 37° C.

These findings hold not only for the pooled sera of healthy individuals but also for the pooled sera of certain protozoal diseases, i.e., relapsing fever and malaria. Having determined the limits of the amounts of complement fixed at 8° C. by pooled negative sera, and having demonstrated the thermostability of complement and the enhancement of the complement absorbing power of syphilitic serum and antigen at 8° C. for six hours, one is enabled to evolve a satisfactory ice-box technique.

TECHNIQUE EMPLOYED.

Owing to the rapid deterioration in titre of hæmolytic serum and of antigen obtained from abroad and stored under Egyptian conditions it was found necessary to manufacture both in the laboratory. The titre of hæmolytic serum utilized was never less than 1 in 2,000.

(1) The *antigen* advocated by Fildes and McIntosh [10] was used. The one per cent. alcoholic solution of cholesterin was stored at room temperature, the ten per cent alcoholic extract of human heart at 8° C. Occasionally the antigen was tested for hæmolytic properties and the anticomplementary dose estimated. Never more than half the anticomplementary dose was used.

(2) A fresh suspension of three per cent of sheep corpuscles was always made. The blood was obtained from a sheep especially kept for the purpose and after citration (two per cent sodium citrate in saline) the corpuscles were repeatedly washed with saline and centrifugalized. The corpuscular suspension was sensitized by adding 4 M.H.D.'s of hæmolytic serum and incubating at 37° C. for half an hour. The mixture was then kept at 8° C. till required.

(3) *Blood* was obtained from the patient within twenty-four hours of performing the test and stored in the ice-chest. Serum was diluted with four volumes of saline and heated to 55° C. for twenty minutes. Complement and any thermolabile anti-complementary body present in the serum was thereby destroyed. Any serum exhibiting anti-complementary tendency in the serum control tubes or any serum in which microbic infection was suspected, was retested at a later date.

(4) *Complement* which was obtained from the serum of a healthy guinea-pig stood in contact with the clot in the ice-chest for six hours before use. The M.H.D. of complement was always accurately determined.

Arrangement of the System for the Final Test by the ordinary Method.—Small volumes of reagents were measured by Donald's dropping pipettes. The total volume in the final stage of the reaction was five cubic centimetres, and each volume of the reagent equalled one cubic centimetre. Racks containing four rows of tubes were utilized and the system was put up as follows :—

(1) The first row contained one volume each of antigen, serum and saline, and one volume of complement diluted so that it contained 3 M.H.D.'s of complement.

(2) The second row contained similar volumes of the above reagents, except that the volume of complement used contained 5 M.H.D.'s.

(3) The third row contained similar volumes of reagents, but the volume of complement used contained 7 M.H.D.'s.

(4) The fourth row contained only serum, saline and complement (3 M.H.D.'s), and served to detect the presence of any anti-complementary tendency in the serum under examination.

Two antigen controls, one containing one volume, and the other two volumes of antigen, were included, and also a pooled negative, and a pooled positive serum.

In the ordinary method the above system was incubated for one hour at 37° C. and then one volume of sensitized sheep's corpuscles was added, the racks were repeatedly shaken and readings registered at intervals of fifteen minutes at 37° C. Final readings were generally made at the end of the hour.

In the ice-box method 4, 6, 8, and 4 M.H.D.'s of complement were used, an additional 1 M.H.D. of complement being added to compensate for the slightly increased tendency for fixation of complement by normal sera with this method.

The time employed for the first stage was always six hours at 8° C. Sensitized corpuscles were then added and readings registered quarter-hourly at 37° C. as with the ordinary method.

Recording of Results.—In both methods a P + + + indicates an entire absence of hæmolysis and is registered as a strong positive reaction. A P + + means that there is an entire absence of hæmolysis in tube of rows 1 and 2, and is a definitely positive reaction. A P + reaction indicates an absence of hæmolysis in the tube of row 1 and is regarded as positive in the presence of suggestive clinical evidence of the disease or in a treated case. A P ± means a partial hæmolysis in the tube of the first row, and sera giving such reactions are retested at a subsequent date.

AN ANALYSIS OF CASES INVESTIGATED BY THE TWO METHODS.

The total number of cases investigated was 1,302. Of these 516 were regarded on clinical grounds as being either definite or probable cases of syphilis. In 216 of these cases no treatment had been instituted. In 300 treatment had been carried out.

The remaining 786 cases presented no clinical evidence of syphilis.

One hundred and eight of these cases were suffering from one of several protozoal diseases occurring in Egypt.

The remaining 678 cases constituted healthy soldiers or patients suffering from metazoal or bacterial infections.

(A) AN ANALYSIS OF THE REACTIONS IN UNTREATED SYPHILITICS.

TABLE I.—“UNTREATED SYPHILITICS.”

Stage of the Disease	Total Examined	Positive by Ordinary Method		Positive by Ice-box Method		Additional cases detected by Ice-box Method	
		Number	Per cent.	Number	Per cent.	Number	Per cent.
Primary	70	44	62·9	52	74·3	8	11·4
Secondary	62	60	96·8	62	100·0	2	3·2
Tertiary	80	67	83·7	76	95·0	9	11·25
Latent	4	3	75·0	4	100·0	1	25·0
Totals	216	174	80·5	194	89·8	20	9·3

An analysis of Table I demonstrates the superiority of the ice-box method in all stages of the untreated disease.

In early primary syphilis the ice-box method is much more sensitive than the ordinary method, but even here one must emphasize that the mode of diagnosis *par excellence* lies in the examination of the serum from the primary chancre by the method of dark-ground illumination. Frequently in early primary syphilis we have demonstrated *Spirochaeta pallidum* where the Wassermann reaction was negative to both methods.

The diagnosis of secondary syphilis is satisfactory by both methods but in tertiary syphilis the ice-box method yields more sensitive results. This we have noted not only in interstitial and parenchymatous syphilis of the nervous system but also in such lesions as aortitis, syphilitic osteitis, etc.

(B) AN ANALYSIS OF THE REACTION IN TREATED SYPHILITICS.

TABLE II.—“TREATED SYPHILITICS.”

Stage of the Disease	Total Number	Positive by Ordinary Method		Positive by Ice-box Method		Additional Positive by Ice-box Method	
		Number	Per cent.	Number	Per cent.	Number	Per cent.
Primary	109	28	25.7	32	29.4	4	3.7
Secondary	129	44	34.1	60	46.5	16	12.4
Tertiary	62	41	66.1	51	82.3	10	16.2
Totals	300	113	37.7	143	47.7	30	10.0

In a majority of the above cases treatment was carried out by Captain R. T. Silvertown, A.A.M.C. It consisted in the administration intravenously of 1.2 to 2.4 grammes of arseno-benzol (four injections) and of 3.6 cubic centimetres of gray oil (six injections) given intramuscularly over a period of six weeks. Potassium iodide was given in tertiary syphilis.

An analysis of this table illustrates certain important features:—

(1) The earlier in the disease antisyphilitic treatment is established the better is the prognosis. Thus after two months intensive treatment 70.6 per cent of cases of primary syphilis presented neither serological nor clinical evidence of the disease, 54.5 per cent of secondary syphilitics yielded similar results, while only 17.7 per cent of tertiary cases yielded these results.

(2) The comparative estimation of cure as yielded by the ice-box and ordinary methods is most important. And it is seen from Table II that ten per cent of all treated syphilitics (i.e., thirty cases out of 300) which yielded a negative reaction with the ordinary technique were positive with the ice-box method.

Immunologists still agree that the Wassermann reaction affords the most reliable known index to the presence of living spirochaetes and the decision of cure must ultimately be made not alone on the absence of clinical evidence of syphilis but in conjunction with at least four negative Wassermann reactions at intervals of six months.

In the following table an analysis is made of the Wassermann reaction in certain protozoal diseases, the two methods being utilized throughout.

(1) It will be noted that during the pyrexial period it is not uncommon in both benign and malignant tertian malaria for 3 M.H.D.'s of complement to be fixed. In one case 7 and 8 M.H.D.'s of complement were fixed by the two methods respectively, but within three weeks of efficient quinine treatment this blood yielded negative results.

TABLE III.—“PROTOZOAL DISEASES.”

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NOTE ON AN ANOMALOUS CASE OF MENINGITIS IN WHICH
PNEUMOCOCCI WERE FOUND IN CLEAR CEREBROSPINAL
FLUID.

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AND

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PRIVATE J. P., aged 22, with twenty months' service in France, was in good health one morning in the trenches. That evening when marching back to rest-billets he was seized with severe pains at the back of the neck and in the legs. He fell out but was able to continue his march with assistance, taking his own time. Next morning he "went sick" and was excused duty for three days. No improvement taking place he was evacuated to the Base through the usual channels. The first record of his temperature was on the sixth day—104° F. His temperature was at the same level when he came under our observation on the tenth day; in the meantime it had never been below 102° F. When we first saw him his condition was suggestive of an infection by a member of the enteric group; he was very ill, very drowsy, had a dry, furred tongue, sores on the lips, tenderness in the splenic region, constipation, a temperature of 104° F. and a feeble pulse of 88. He complained of intense headache. Feeble tendon-reflexes could be obtained with difficulty, abdominal reflex was absent. There was a raised reddish blotchy rash chiefly on the limbs and especially noticeable on pressure points about the knees, elbows and ankles, but extending also to the soles of the feet. A blood-culture was negative and agglutination reactions gave no evidence that the case was one of enteric or paratyphoid. There was a leucocytosis of 20,800 per cubic millimetre.

Meningitis was suggested by the history of nuchal pains at onset, by slight stiffness of neck and back, by persistent intense headache, a "very doubtful"

Kernig, constipation and a slow pulse. There was no squint, little photophobia and no vomiting.

Lumbar puncture under local anæsthesia was performed at once. The fluid was under considerable pressure pouring out in a steady stream. Twenty cubic centimetres were removed. The fluid was "gin-clear" to the naked eye; it contained a little blood and large numbers of Gram-positive lanceolate encapsulated diplococci, morphologically indistinguishable from the pneumococcus of Fraenkel. No growth, however, was obtained at the end of three days in any culture media. The possibility of the collecting tubes having been contaminated could be excluded. Apart from the blood there were no cells present in the fluid. The same evening the patient's temperature fell from 104° to 99.2° F. Next day his mental condition was much clearer, and steady and rapid improvement in all his symptoms had commenced: in two days his temperature had become normal and there was no return of pyrexia during the succeeding fourteen days for which he remained under observation. The rash disappeared gradually in three days. The second lumbar puncture was performed on the twelfth day of illness: the fluid was under lower pressure, and was again "gin-clear": a few micro-organisms similar to those described above were found; again these did not grow on culture. There was no blood in the centrifugalized fluid, but a considerable number of small mononuclear leucocytes were present.

The principal points of special interest in this case are:—

- (1) The slightness of the meningeal signs.
- (2) The close resemblance of the clinical picture to that of an enteric infection.
- (3) The very peculiar characters of the fluid.
- (4) The "crisis" coinciding with the first lumbar puncture.
- (5) The rash.
- (6) The complete absence of symptoms or signs pointing to a pulmonary infection.

NOTES ON SOME CASES OF GUNSHOT WOUND OF THE ABDOMEN IN A CASUALTY CLEARING STATION IN MESOPOTAMIA.

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THE following notes refer to some of the cases of gunshot wound of the abdomen which came under my care in No. 16 Casualty Clearing Station, during the fighting round Kut-el-Amara.

The earliest that any case reached the hospital after receipt of wound was four hours, and this case was not from the trenches (Case 6).

The average time between being wounded and reaching hospital was about sixteen hours, so that it is easily understood that a very fair number of cases reached us in a condition hopeless for operative treatment.

No mention is made of this class of case, or of cases arriving showing no abdominal symptoms. For practical purposes a case wounded in the abdomen and showing no abdominal symptoms after sixteen hours, can be looked upon

as safe, and in any event is fit for evacuation to a stationary hospital, and should not be kept in a casualty clearing station.

All the roads leading to this hospital were "kutchas," and in view of their condition and the distance to be travelled, sixteen hours was as quickly as we could expect to get these cases, particularly as the motor ambulances were ordered to go slowly with serious cases.

MANAGEMENT.

Most of the cases required rest, and in some cases either intravenous or subcutaneous infusion, for an hour or so after arrival, before any operative treatment could be considered.

A warm bed, clean pyjamas and rest, often worked wonders in a man who at first sight looked hopeless.

Cold, which at certain times of the year is intense in Mesopotamia, was a problem, but was overcome as far as possible by the use of oil stoves, which, even in tents, which were all that we possessed, made a very considerable difference.

OPERATIVE TECHNIQUE.

The abdomen was usually opened in the mid line, or the right or left para rectal incision used as was considered would give the best access to the lesion.

Suture was used whenever possible, and if resection was necessary, end to end anastomosis was always performed.

The abdomen was never washed out, but only mopped out with gauze swabs soaked in saline.

Pelvic tube drainage, the tube being removed in twelve hours, was employed.

AFTER-TREATMENT.

Fowler's position and rectal infusion were routine. Beyond these each case was treated on its own merits. Pituitrin was found very useful for collapse, and also to overcome intestinal stasis a day or so after operation. A turpentine enema often proved of value for flatulence.

Case 1.—Entrance wound right buttock, exit through right rectus below the umbilicus. Operated on twelve hours after being wounded. Condition of patient good, only slight rigidity of lower abdomen. Vomited twice after admission. At operation three wounds were found in the small intestine; these were closed by suture. Convalescence uninterrupted; evacuated on the tenth day, doing well.

Case 2.—Entrance wound left mid axillary line above the crest of the ilium, exit just above the umbilicus. Operation twelve hours after being wounded. Patient's condition very bad, required infusion subcutaneously during the operation. Showed all the signs of an abdominal catastrophe.

At operation multiple wounds of the small intestine were found, and a long tear in the pelvic colon. Ten inches of small intestine were resected and the pelvic colon sutured. Patient gave rise to considerable anxiety for a few days, but was finally evacuated on the twelfth day, doing well.

Case 3.—Entrance wound below umbilicus on the left side, exit wound behind

at the same level. Operation twenty hours after being wounded; condition of patient fair. At operation three wounds were found in the small intestine; there was considerable matting of the intestines round the perforations, which were close together, and they were to some extent shut off. Wounds were sutured. It is possible that this man would have developed a local abscess and perhaps a faecal fistula, without operation. Evacuated on the tenth day, doing well.

Case 4.—Entrance left buttock, exit below and to the left of the umbilicus. Vomiting, rigid abdomen and fast pulse. At operation no intestinal lesion was found, only a small amount of blood in the peritoneal cavity, origin uncertain. Belly closed. Evacuated on the tenth day, healed.

Case 5.—Entrance three inches above the umbilicus, exit below the left costal margin. Operation twelve hours after being wounded. At operation a large ragged tear in the splenic flexure was found. Eight inches of splenic flexure resected. Patient died about six hours later. His condition on admission was very bad and it was only after intravenous infusion that it was thought possible to attempt any operative interference.

Case 6.—Accidentally wounded by an officer's servant who was cleaning a revolver. Operation five hours after being wounded. Entrance below right costal margin, exit just above umbilicus. At operation multiple wounds in the small intestine were found; resection of over two feet of small intestine performed. Patient did perfectly for five days and was thought to be out of danger, when he suddenly became faint and short of breath, and died in an hour or so. It was thought to be a case of pulmonary embolus. I regret that no post-mortem examination was performed owing to a rush of work at the time.

Case 7.—Entrance left buttock, exit below right iliac crest. Blood-stained urine was withdrawn from the bladder by catheter. At operation two tears were found in the bladder near the base. These could not be sutured, and suprapubic cystotomy was done. Small pieces of bone from the ilium were removed from the interior of the bladder. Bladder drained, and also the pelvis for twelve hours. Evacuated ten days later, doing well.

Case 8.—Entrance four inches below left costal margin, exit same level below right costal margin. Operation twelve hours after being wounded. Condition of this patient bad. At operation multiple wounds in small intestine found. Resection of three feet of small intestine performed and end to end anastomosis done. Patient died the next day.

The above cases are representative of the type that we received in the hospital. A fairly large number of cases were admitted whose condition rendered any operative interference impossible, and these were particularly disappointing. Quite a number of cases were evacuated who required no operation, and in some of these a consideration of the entrance and exit wounds made it difficult to believe how they could have escaped an intestinal lesion. Case 4 is interesting in this respect, no lesion being found at operation, though his condition and the position of the wounds made one definitely to expect such. It is fair proof, I think, that a bullet *can* penetrate the abdomen without damaging the gut.

BOMB WOUND OF CHEST; PENETRATION OF AORTA; OBSTRUCTION OF FEMORAL ARTERY BY MISSILE.**BY CAPTAIN A. B. AITKEN, F.R.C.S.***Royal Army Medical Corps.***AND****LIEUTENANT T. HOWELL, F.R.C.S.***Royal Army Medical Corps.*

THE condition found in the case which is the subject of this note seems to us of sufficient interest to put on record. The details are as follows:—

Sapper J. D., wounded by a bomb explosion, was admitted to this hospital at 2 a.m. on September 3, 1917, about three and a half hours after the injury occurred. He complained of severe pains in his chest and extending down the right leg, which he described as feeling numb, dead and powerless.

He was obviously gravely ill with marked pallor and restlessness: pulse was 140 and respiration 40 per minute. There was a small punctured wound about three inches to the left of the spine between ninth and tenth ribs; bleeding was trifling. Signs of extensive left-sided pleural effusion were present and the abdomen was soft although somewhat distended. The right leg from the knee downwards was cold; with some loss of sensation; no pulse could be detected in the posterior tibial artery of this side, pulsation in the femoral arteries of the two sides was equal.

A few hours later the coldness and pallor of the right leg were more marked, with some discoloration of the skin in patches. Patient did not rally in the least but became steadily worse and died about 3 p.m. on the same day, i.e., about eighteen hours after the injury occurred.

At the autopsy the only external injury present was the small punctured wound of the left side of chest. The left pleural cavity was full of blood partly clotted; lung collapsed but intact. On sponging away the effused blood a puncture of the parietal pleura corresponding to the external wound was found about two inches from spine in the ninth interspace, with a similar puncture of the pleura over the posterior mediastinum at a slightly higher level.

There was extensive hæmorrhagic infiltration of the tissues of the posterior mediastinum, extending into the roots of both lungs. Right pleural cavity and lung were intact and the heart normal.

On slitting up the thoracic aorta there was a slit-like wound $\frac{3}{8}$ -inch in length on the left side of the vessel between the origins of two adjacent intercostal arteries; a probe passed through the puncture in the mediastinal pleura above noted entered this slit, the direction of the track being upwards and inwards. On the opposite wall of the aorta there was an irregularly crescentic wound which involved only the intima and media.

The obstruction in the right femoral artery was found to be situated at the level of the opening in the adductor magnus tendon. It was due to a small fragment of metal roughly oblong in shape and measuring $\frac{3}{8}$ -inch by $\frac{3}{8}$ -inch by $\frac{1}{4}$ -inch. This was lying in the lumen of the artery which for a distance of 1 inch to $1\frac{1}{2}$ inches proximal to it was filled with red clot.

The points of interest in the case would appear to be:—

(1) The association of a very slight external wound with symptoms of severe chest injury and of femoral embolus.

(2) The course followed by the missile. This, traversing the left pleural sac and penetrating the thoracic aorta impinged on the opposite wall of the vessel partially rupturing it, and was then carried with the blood-stream to lodge in the lower part of the right superficial femoral artery.

For permission to publish this case we are indebted to Lieutenant-Colonel E. A. Bourke, D.S.O.



Review.

A MEDICAL FIELD SERVICE HANDBOOK (Oxford War Primers). By Acting Lieutenant-Colonel C. Max Page, D.S.O., R.A.M.C., S.R., with foreword by Major-General Sir George Makins, G.C.M.G., C.B. London: Henry Frowde, Hodder and Stoughton, 1919.

Records of professional experience gained with field medical and regimental units on the Western Front have not been numerous, partly because the arduous nature of the duties allows little time for reflection and deduction, and partly because to many the work is merely a somewhat monotonous routine. In his Medical Field Service Handbook, Lieutenant-Colonel Max Page discusses the most important problems with which an R.A.M.C. officer serving with a regiment or field medical unit has to deal. He emphasizes fully the important place which such an officer occupies in army organization for prevention of disease and care of the sick and wounded.

After a brief review of the essentials of personal hygiene and field sanitation, the author passes to a discussion of those ailments which, though apparently trivial, occupy so much of the attention of the regimental medical officer, and which are most important causes of wastage and inefficiency. No attempt is made at lengthy discussion, but the author states clearly the methods of prevention and treatment of such affections as lousiness, scabies, and ulcerative and inflammatory infections of the skin, which he has found most effective and practical in the field.

Trench fever, pyrexia of uncertain origin, the typhoid group of fevers, diarrhoea, myalgia, trench feet, and the common infectious diseases are all dealt with, and under each heading practical advice is given on prophylaxis, diagnosis and prognosis, which should materially help a medical officer, particularly in determining which patients to retain with the unit for observation and which to evacuate to the rear. It is to be regretted that the section on Influenza has not been elaborated in the light of the experiences of the summer of 1918.

The second part of the book is devoted to the treatment of wounds and the effects of toxic gas. Here again the author confines himself to essentials, and states lucidly what his experience has taught him to be the most practical way of dealing with each type of injury. He emphasizes the danger of trying to do too much at the front, and wisely confines the work of the regimental medical officer to carrying out urgent treatment for hæmorrhage and shock, preventing further injury, whether from infection or rough transport, and sending his patients as expeditiously and comfortably as possible to centres where more elaborate measures can be safely carried out.

This little book is very readable and is well worthy of study by medical officers in training or engaged in regimental work.

W. R. G.

Journal
of the
Royal Army Medical Corps.

Original Communications.

I.—A REPORT FOR THE PATHOLOGICAL COMMITTEE OF
THE WAR OFFICE OF AN INQUIRY INTO GINGIVITIS
AND VINCENT'S DISEASE OCCURRING IN THE ARMY.

BY LIEUTENANT-COLONEL SIR DAVID SEMPLE.

Royal Army Medical Corps.

CAPTAIN CECIL PRICE-JONES.

Royal Army Medical Corps.

AND

MISS L. DIGBY.

(Continued from p. 232.)

V.—THE CULTIVATION AND CHARACTERS OF THE *Bacillus fusiformis*
FOUND IN THE MOUTH AND THROAT IN CONDITIONS OF HEALTH
AND DISEASE.

Introduction.—*B. fusiformis* is apparently a universal inhabitant of human mouths.

Lewkowicz, 1903 [15], was the first investigator to obtain *B. fusiformis* in pure culture, and since then several investigators [8, 30, 19, 21, 14, 12] have isolated it from a variety of sources, including healthy mouths, a Vincent's angina, the blood-stream, etc. We have obtained numerous pure strains from swabbings of apparently healthy gums (figs. 19 and 27), from gums showing a condition of pyorrhœa and gingivitis (figs. 25 and 26), and from the gums and throat of an acute case of Vincent's angina (fig. 22).

Methods Employed.—Cultures were obtained on serum agar and in serum broth, about a quarter of serum being added to three-quarters of the medium.

The bacilli appear to grow most freely in a medium giving a + 5 reaction to phenolphthalein. All cultures in test tubes were made relatively anaerobic by soaking the wool plug with sodium hydrate and pyrogallic

acid, the whole covered by a tightly fitting rubber cap and sealed with paraffin wax. The cultures were incubated at 37° C.

The first strain was isolated from a growth in serum broth (fig. 23), subcultured on to serum agar slopes, and frequently transplanted according to the method employed by Weaver and Tunncliffe [24, 25, 30, and 31]. After several weeks a mixed growth was obtained, having staphylococci in the centre, from which radiated irregular prolongations of *B. fusiformis*. A pure culture was obtained from one of these outgrowths.

This method was tedious, and was discarded in favour of that recommended by Krumwiede and Pratt [12 and 13]. This entails a simple technique, and usually ensures the isolation of a pure strain from any swab in the course of a few days.

The serum broth mixed culture, derived from the emulsion of the swab, was plated after twenty-four to forty-eight hours' incubation. Four dilutions of the culture were made in about 0.5 cubic centimetre of serum broth. A wide tube of melted agar, to which inactivated serum had been added, was inoculated with a dilution at about 40° C. Each inoculated tube was poured into the cover of a Petri dish; the bottom of the dish inverted was then lowered on to the still liquid agar, care being taken to avoid air bubbles. When the agar had solidified, the two plates were sealed together with melted paraffin (figs. 1, 2, and 3). After forty-eight hours' incubation, the colonies of *B. fusiformis* (to be described later) were easily recognized, and were subcultured in the "semi-solid" medium of peptone broth, serum, agar, and gelatin, used by Krumwiede [12].

Only about thirty per cent of these subcultures grew. This confirms the experience of other workers that *B. fusiformis* requires to be subcultured in considerable numbers.

In successful subcultures yellow disk-like colonies appear, often after forty-eight hours (figs. 16 and 17), though sometimes not until the third or fourth day (fig. 18). The growth of a number of colonies tends to be broad and thin, like the blade of a knife (fig. 19). When the colonies are few and isolated (figs. 8 and 11), they may grow into a thick irregular mass (figs. 9 and 12). After about three weeks, feathery outgrowths (figs. 9 and 10) proceed from those colonies situated in the lower portion (i.e., in the most anaerobic part) of the tube. Sometimes a cloudy zone (figs. 14 and 15) appears towards the sides of the tube. These phenomena will be discussed subsequently.

The modified method of anaerobic plating used by Dick [6] has been also tried with success and proved specially useful in the attempts to culture single or small numbers of organisms.

Cultural Characters.—It is proposed to commence the description of the cultural characters with an account of the colonies grown anaerobically in the depth of a serum agar plate according to Krumwiede's [12] method (figs. 1, 2, and 3).

The colonies are pleomorphic, but, as a rule, only one type of colony is found in each plate.

The commonest type of colony is small (0.3 to 0.5 millimetre), of a greenish colour with a darker centre, and under low magnification shows concentric and diagonal markings, somewhat resembling a golf ball (fig. 4). It is strongly adherent to the medium. In side view it is lenticular in shape (figs. 1 and 2). Occasionally these colonies are surrounded by a cloud (figs. 1, 2, 3, 6, and 7). This type of colony is mainly composed of "typical" *B. fusiformis* (figs. 22, 25, 26, and 27), and a few long "leptothrivial" forms.

Another type of colony is larger (0.5 to 1 millimetre) of the same colour and markings, but of a gelatinous consistency, and never surrounded by a cloud. It is less adherent to the medium, and when touched with a platinum needle a large portion of the colony will be detached. This type of colony is composed almost entirely of "leptothrivial" threads (fig. 33) growing closely together to form a dense mycelium, a few "typical" *B. fusiformis* being included in the network.

A colony, "intermediate" in size between the two described above, may also occur; this is composed for the most part of filiform bacilli (fig. 32) "intermediate" in character between the "typical" and "leptothrivial" forms.

The characteristic mat-like colonies with thready outgrowths (fig. 5), described by Krumwiede [12] and others, were only occasionally met with. This may be due to differences in the reaction, strength, and depth of the medium employed in this laboratory.

On subculture the "typical" fusiform bacilli have been obtained from "leptothrivial" colonies; and "leptothrivial" bacilli from colonies containing a preponderance of "typical" forms.

To establish the true pleomorphism of *B. fusiformis* it was essential to obtain these pleomorphic forms from a single typical organism. This was attempted by the method described by Barber [1] kindly demonstrated by Miss Muriel Robertson (Lister Institute). The narrow coverslip holding the minute drop and the single organism, was either dropped into a tube of serum broth, or into a somewhat liquid "semi-solid" medium; or it was placed, drop downwards, on a solid serum agar plate, liquid serum agar being then poured over the coverslip; and when this solidified it was covered with melted paraffin according to Dick's [6] method.

Cultures of single organisms, or of collections containing as many as forty organisms, prepared in serum broth or in the "semi-solid" medium, were invariably unsuccessful. Single organisms did not grow on plate cultures. One discrete colony was obtained on a serum agar plate from a drop in which three organisms had been isolated. A growth was obtained from a drop in which five organisms had been isolated. Several colonies were obtained from drops in which fifteen, sixteen and twenty-two organisms had been respectively isolated (see table).

The one colony from three organisms was therefore the nearest approach

to a "single organism" culture, and was considered as such. This colony was sub-cultured, and from it both "typical" and "leptothricial" forms were obtained, thus demonstrating the true polymorphism of *B. fusiformis*.

TABLE GIVING THE RESULTS OF A SERIES OF EXPERIMENTS CARRIED OUT WITH THE OBJECT OF OBTAINING A GROWTH FROM A SINGLE *B. fusiformis* OR FAILING THIS FROM AS FEW ORGANISMS AS POSSIBLE.

Number of experiments	Number of <i>B. fusiformis</i> isolated	Source of <i>B. fusiformis</i>	Medium from which taken	Age of growth	Medium used for experiment	Result
1	1	Gingivitis A	"Semi-solid"	13 to 14 days	Serum agar plate	No growth
1	2	" "	" "	" "	" "	" "
1	5	" "	" "	" "	" "	" "
2	6	" "	" "	" "	" "	" "
1	8	" "	" "	" "	" "	" "
1	15	" "	" "	" "	" "	" "
1	30	" "	" "	" "	" "	One colony
2	1	" "	" "	3 days	" "	No growth
1	2	" B	" "	" "	" "	" "
2	3	" "	" "	" "	" "	One colony on one of the plates
1	5	" "	" "	" "	" "	Growth. Colonies not well-defined
1	12	" "	" "	" "	" "	No growth
1	14	" "	" "	" "	" "	Several colonies
1	15	" "	" "	" "	" "	" "
1	22	" "	" "	" "	" "	" "
8	1	" A	Serum broth	3 to 4 days	Serum broth	No growth
2	2	" "	" "	" "	" "	" "
1	3	" "	" "	" "	" "	" "
1	6	" "	" "	" "	" "	" "
1	8	" "	" "	" "	" "	" "
1	2	" B	" "	4 days	"Semi-solid"	" "
3	1	" "	" "	3 "	" "	" "
1	2	" "	" "	" "	" "	" "
1	3	" "	" "	" "	" "	" "

Morphological Characters exhibited by B. fusiformis under natural conditions.—Films from swabs were fixed in the flame and stained with weak carbol-fuchsin.

In films of exudates from cases of "Vincent's Angina" (fig. 20) several "types" of *B. fusiformis* are present, showing that pleomorphism occurs under natural conditions, and is a habit intensified under cultivation; as a rule the *fusiform* character is constant in all "types."

The predominating "type" seen in a direct film of Vincent's Angina (fig. 20) is a slender, straight or slightly curved rod with pointed ends, varying in length from 4 to 8 microns. Frequently deeply staining granules are disposed at intervals in the substance of the rod. Occasionally, at the centre of the rod there is a small vacuole suggesting the commencement of transverse division. In this investigation a bacillus with these characters has been regarded as the "type."

Amongst these "typical" bacilli there are others which stain diffusely and have long, finely pointed ends. Two rods may be joined, end to end, by a fine connection. "Giant" forms (fig. 21) as described and figured by Vincent [29] may also be present. This form of the bacillus is relatively large and broad, torpedo-shaped, and often shows granular markings. Occasionally small sickle-shaped fusiform bacilli are met with.

Morphological Characters exhibited by B. fusiformis under Cultural Conditions.—When grown on artificial media the bacilli assumed the pleomorphic characters referred to above. This pleomorphism is apparently due in part to the cultural conditions. Several observers have succeeded in changing the morphology by transferring them from one kind of medium to another.

The bacilli growing in the depths of a stab culture are usually more filiform than those growing near the surface, but extreme pleomorphism may exist among bacilli growing together in the same portion of the medium.

A young culture (about forty-eight to one hundred and twenty hours) chiefly consists of the "type" form (figs. 22, 25, 26, and 27). The bacilli are comparatively short and slender, and more variable in length than the bacilli seen in direct films. The rods are pointed at either end, and may either stain diffusely, or may show two or more deeply staining metachromatic granules arranged lineally at intervals. The "type" usually possesses two granules, but these increase in number with the length of the bacillus. Both in "semisolid" and in serum broth cultures exceedingly long bacilli are found. These measure as much as 100 microns to 200 microns, and show metachromatic granules. These granules stain with carbol-fuchsin (fig. 25), but are more distinctly differentiated by Giemsa and Leishman's stains (fig. 26). They take the basic stain when treated with Heidenhain's hæmatoxylin (fig. 24), confirming Hoelling's [11] view that they are of the nature of chromatin. Heidenhain's hæmatoxylin differentiates the structure of the bacilli well, and brings out more detail than any of the other stains used. The staining reaction shows the chromatin to be situated chiefly in the metachromatic granules and in the ends of the bacilli. Between these deeply staining portions are granular areas and clear spaces defined by the outline of the bacillus, which is here broadened out, but becomes narrowed again at the junction of the chromatic granules. In the short forms of bacilli the differentiation is not so marked, owing to the chromatin being more diffused throughout the rod.

Normally the individuals of a group of bacilli are arranged in a parallel sheaf-like manner (fig. 22). Occasionally the bacilli are connected end to end, forming long chains.

In young cultures of "typical" rods, isolated bacilli are constantly present which have assumed a "wavy" form (figs. 28, 29, and 30). One end only of the bacillus may become convoluted, or the whole bacillus may be thrown into waves resembling those of a spirochæte. These "spiro-

chaete-like" bacilli do not possess metachromatic granules, but take the stain evenly and deeply, like bacilli. Their breadth is that of the average type, and from their general character they are unmistakably bacilli which have assumed a wavy form. They are distinct from the spironemata with which they are associated.

Amongst the "typical" bacilli may be large torpedo-shaped rods, with no definite metachromatic granules, but showing a diffuse, finely granular staining reaction.

The other types of bacilli observed show extreme variations in size from very small, slightly curved or straight rods, to exceedingly long thread-like forms. They may be found in any culture, but are especially characteristic of certain conditions.

The cloudy areas which occur near the inner surface of the tube of a "semisolid" stab culture (figs. 14 and 15) are formed mainly by very slightly curved bacilli. When subcultured, this small variety reverts to the "type" form. The feathery outgrowths from colonies (figs. 9 and 10) situated in the lower depth of a "semisolid" stab culture are also composed of exceedingly short forms. These also are found in salt-free serum broth cultures. When subcultured into a change of medium, the bacilli regain the normal "type."

Besides the long forms of bacilli with metachromatic granules described above, there is another fine thread-like "leptothricial" type which shows no metachromatic granules, and stains evenly (fig. 33). These "leptothricial" threads are especially abundant in the previously described large colonies in serum agar plates, though they may be found in other cultures. They are generally slender and long, and produce a dense mycelial growth in which only a few free ends are to be seen. Amongst the fine threads will be found broader more ribbon-like strands, showing a granular staining reaction. Some of these broader forms have a denser end (fig. 31) (occasionally a definite clublike appearance), followed by a clear space, and alternating denser and clearer areas. These may be continued throughout the length of the thread, and present the appearance of a sheath containing segments of protoplasm. Probably this appearance is due to plasmolysis.

In some cultures a filiform bacillus (fig. 32), intermediate in character between the "typical" and "leptothricial" forms, may be present. These bacilli vary considerably in length and in form.

Longevity of B. fusiformis.

Some strains grow more vigorously than others. The first strain isolated in September, 1918, is still growing well in subcultures in April, 1919; two of the other strains isolated subsequently have died. Subcultures from all strains frequently fail to grow. Kept at 37° C., a culture was alive after fourteen and a half weeks. As a rule, however, cultures which are not subcultures will die between the tenth and eleventh week,

and irrespectively of the temperature, "room" or 37° C., at which they have been kept.

After about a fortnight in serum broth, the bacilli become attenuated and vacuolated. Gradually they lose their power of staining, though, if examined by the Congo red film method, they appear more or less well defined.

Subcultures made from these cultures if more than ten weeks old will fail to grow, but if under ten weeks old the subcultures will be successful and the organism will resume its normal morphology. This observation has been made repeatedly.

Staining of B. fusiformis.—*B. fusiformis* and its pleomorphic forms are strictly Gram-negative. On occasions; in a few direct films from the mouth, the bacilli retained the stain to some extent. When cultured they were invariably Gram-negative, with the exception of a serum agar stab culture in which they were feebly Gram-positive.

Motility of B. fusiformis.—It is uncertain whether *B. fusiformis* is motile. According to some observers it is actively motile and possesses many flagella. Veszpremi [26], Graupner [10], Muhlens [19], and others have seen flagella.

Bacilli in fresh exudates and from young cultures examined by dark-ground illumination and in hanging-drop preparations never exhibited motility. Bacilli from both these sources were stained according to the methods of Stephens and Pitfield for the demonstration of flagella (using *B. typhosus* as a check on the technique), but flagella could not be demonstrated.

Relationship of B. fusiformis to the Associated Spirochætes.—This investigation has afforded no evidence of any relationship existing between *B. fusiformis* and the associated spirochætes.

Pure cultures of *B. fusiformis*, in stabs, plates, and broths, and Noguchi media have been kept, without subculturing, for varying periods up to three and a half months. These have been constantly examined, but in no instance have spirochætes been found. The feathery outgrowths (figs. 9 and 10) in the semi-solid stabs are suggestive of a possible spirochætal growth, but repeated examinations of these showed only the above mentioned exceedingly small form of bacillus.

In this connexion the published accounts offer insufficient evidence, and it appears most probable that the spirilla of Tunncliffe (24 and 25) are the wavy forms of fusiform bacilli described above, and have no genetic relationship with the spironemata of the mouth.

VI.—THE MORPHOLOGY AND CULTIVATION OF SPIROCHÆTES FOUND IN THE MOUTH IN HEALTH AND DISEASE.

Three varieties of spirochætes were seen in films obtained from swabs from the gums of healthy mouths, cases of gingivitis and from the ulcerations of Vincent's angina. These three varieties were seen in all cases, and

appeared to be morphologically identical irrespective of the source from which they were obtained.

Adopting the nomenclature and classification of Mr. Clifford Dobell, to whom we are indebted for much advice and suggestion, these organisms are to be regarded as *Spironema buccale*, *S. medium* and *S. dentium*.

Methods Employed.—Films fixed by heat and stained by carbol fuchsin are not satisfactory. The organisms become distorted by plasmolysis, stain variably or not at all, and reliable identification and classification are not possible. In all cases specimens were examined by dark-ground illumination and in Congo-red films.

Cultivations were made in tubes of freshly prepared serum agar (about twenty per cent serum), into which, before the medium had solidified, were introduced swabs of cotton wool taken direct from gums or fauces, or swabs impregnated with broth emulsions of the material to be cultivated; after the swab had sunk to the bottom of the tube and the medium had solidified, liquid paraffin was poured on to the surface of the medium and the wool plug of the tube soaked with sodium hydrate and pyrogalllic acid; the tube was then covered with a rubber cap, sealed with melted paraffin, and incubated for varying periods—three days to three weeks at 37° C.

The cotton wool swabs appear to act like the portions of sterile tissue employed by Noguchi, for which they are a very practical and simple substitute.

With tubes of Noguchi broth and Noguchi serum agar but little success was obtained. With the swab cultures it was possible to grow the spironemata to fifth subculture without difficulty. So far as the time limit of the investigation has permitted these organisms have not been obtained in pure culture; had the research been extended it is probable that pure cultures eventually would have been cultivated.

Examination of the cultures showed that the spironemata were invariably situated in the portion of the medium immediately surrounding the swab. They were never found in portions of the medium at any distance from the swab. It was immaterial to the growth of these organisms if the swab was situated at the bottom or at the top of the medium. These facts seem to suggest that these spironemata are not strictly anaerobic.

Stab cultures made with capillary pipette in Noguchi serum agar or in serum agar containing sterile swabs of cotton wool were unsuccessful. In no case was there observed any cloudy outspreading from the stab canal, such as has been described by Noguchi and others [20].

Some attention was directed to the reaction of the medium. As in the case of cultivation of *B. fusiformis*, it was found that a +5 agar was more favourable to growth than +10; and apparently equally good results, sometimes better results, were obtained with +3 and with +0 agar. More research is needed on this subject, but it is suggested that +0 or possibly a really alkaline medium would give the best results.

Morphology.—*Spironema buccale*. Fig. 1 is the coarse variety. Under dark-ground illumination it appears in varying lengths of from ten microns to twenty microns. Compared with the other mouth spironemata its width is strikingly greater—probably in the category of 0.1 micron to 0.2 micron, though actual measurements were not attempted. It has coarse waves; they are steep and few in number to a definite length of organism; three to four waves to every ten microns. The ends of the organism are pointed; there is no evidence of terminal flagella or undulating membrane, nor can any internal structure, “chambering” or granules be detected. It is actively motile, having a reversible corkscrew movement often accompanied by a progressive serpentine motion. In Congo-red films the ends of the organisms sometimes show terminal “wisps” (see under) though more often they appear blunted, and generally its appearance is coarser than when observed under dark-ground illumination (fig. 1 *a, b*). It frequently appears bent and partly twisted on itself, or with other spironemata (fig. 1 *c, d*). Appearances suggesting true longitudinal division have never been observed. Occasionally portions of the spiral appear straighter and thinner, but actual signs of transverse division have not been seen.

Differential counts of the spironemata from a presumed healthy mouth showed the relative number of *Spironema buccale* to be about 50 per cent.

Spironema medium.—(Fig. 2). This is a much more slender organism than the preceding. Under dark-ground illumination it appears in varying lengths of from twelve microns to thirty microns or longer. Some specimens extended nearly across the field of the microscope and must have approached fifty microns in length. The width is probably in the category of 0.01 micron to 0.02 micron, but actual measurements were not attempted. The waves are small and shallow, and number six to eight to every ten microns length of the organism. The ends of the thread are tapering and pointed; terminal flagella, undulating membrane or internal structure could not be detected.

Its motility is less active than that of *Sp. buccale*; it is of the nature of a slow corkscrew rotation accompanied by a gliding movement: serpentine movement was not perceptible. These organisms often show a faint blueish tint which renders them more readily visible by contrast.

In Congo-red films *Sp. medium* retains its tapering ends and often shows fine flagella-like terminal “wisps” (fig. 2 *b*, fig. 34). These “wisps” are not true flagella. They belong to a much coarser category. Flagella (e.g. of *B. typhosus*) cannot be demonstrated by Congo-red films.

These wisps are probably the results of transverse division. It is quite common, especially in the longer forms, to see the spiral interrupted at one or more points, and drawn out into a fine, barely perceptible thread (see fig. 2 *c*). It is suggested that the organism readily breaks or divides at these thinned positions, the result being two or more separate spironemata with fine terminal wisps. In the photo (fig. 37) of *Sp. medium* from a presumably healthy mouth one of the terminal wisps shows fine waves.

Twistings and entanglements of the organism with itself and with other spironemata are very common. The entanglements seem to be especially frequent in specimens prepared from sub-cultures (fig. 36). Appearances suggesting longitudinal division have never been observed.

Differential counts of the spironemata from a presumably healthy mouth showed the relative number of *Sp. medium* to be about 13 per cent.

Spironema dentium.—(Fig. 3). This is the small variety. Under dark illumination it appears in varying lengths of from four microns to eight microns; its width is probably less than that of *Sp. medium*, but measurements were not attempted. The waves are not so shallow (the arc subtending an angle of about 90 degrees) but are more numerous, four to five per spiral, or equivalent to about 8 or 10 per 100 microns of length. The ends of the spiral are tapering and pointed; terminal flagella, undulating membrane and internal structure could not be detected. The motility is sometimes very active, of a rapid twisting and coiling type, but more commonly only a slight corkscrew motion is seen. Like *Sp. medium* it seems to have a faint bluish tint.

In Congo-red films the tapering pointed ends are visible and occasionally there are terminal wisps similar to those described above (fig. 3 b). Entanglements are frequently seen, and bent and partly coiled forms are very common (see fig. 3 c and d). Differential counts of spironemata from a presumably healthy mouth showed the relative number of *Sp. dentium* to be about 37 per cent.

(Mr. Dobell recognizes a fourth very minute variety which in this investigation has not been sufficiently differentiated, and has been probably included with *Sp. dentium*).

Systematic observations on the cultivation of spironemata have been carried out only during the last four months of this inquiry. During that time, unfortunately, specimens from only two cases of gingivitis and one case of Vincent's angina were received for examination.

During the previous five months attention was directed to the cultivation of *B. fusiformis*, and the search for any evidence that these bacilli gave rise to spirochaetal forms. At that period facilities for dark-ground illumination were wanting, and reliance was placed entirely on the examination of films which had been fixed by heat and stained by carbol fuchsin, and which, as stated above, were shown to be quite unsatisfactory and misleading.

Repeated attempts with the employment of improved methods and using unquestionable pure cultures of *B. fusiformis* were invariably negative, and there was no evidence whatever to suppose that the *B. fusiformis* can develop into or give rise to spironemata. The foundation for this probably erroneous suggestion rests on the mistaken interpretation of the wavy leptothricial forms which the bacillus may assume (v. s.).

Two Cases of Gingivitis.

(1) Lt. H., acute gingivitis lower incisors, four days' history following influenza fourteen days previously.

Dark-ground illumination and Congo-red films of swab from gum showed many spironemata; the three varieties were readily recognized; there were also many *B. fusiformis* and other organisms. Differential counts of the spironemata showed: *Sp. buccale*, 56 per cent; *Sp. medium*, 12 per cent; *Sp. dentium*, 33 per cent; relations in close agreement with the relative numbers found in preparations from the presumably healthy mouth.

Swab cultures in serum agar were made and examined on the tenth day. The medium surrounding the swab showed a white opaque growth, which, on examination, was seen to contain great numbers of spironemata. The culture had a very foul odour. Differential counts of the spironemata in this culture showed *Sp. buccale*, 12 per cent; *Sp. medium*, 23 per cent; *Sp. dentium*, 64 per cent; and cultures examined on the following (eleventh day) showed: *Sp. buccale*, 10 per cent.; *Sp. medium*, 16 per cent; *Sp. dentium*, 74 per cent. A subculture from this culture examined eight days later showed: *Sp. buccale*, 1 per cent; *Sp. medium*, 26 per cent; *Sp. dentium*, 73 per cent., and a subculture from this examined after four days showed: *Sp. buccale*, 1 per cent.; *Sp. medium*, 22 per cent; *Sp. dentium*, 77 per cent.

In subsequent subcultures the *Sp. buccale* was only found after long search; *Sp. medium* and *Sp. dentium* appeared in about equal proportions.

These differential counts seem to suggest the *Sp. buccale* either does not grow in the culture or dies out.

The numbers of *Sp. medium* and *Sp. dentium* should be regarded only as approximately correct. It was sometimes difficult to differentiate the smaller forms of *Sp. medium*, and possibly these were wrongly included among *Sp. dentium*.

(2) Pte. F., ulcer of gum (?), impacted wisdom tooth, with abscess. Dark-ground illumination and Congo-red films from swab from the ulcer showed many spironemata of all three varieties, also many *B. fusiformis* and other organisms.

Differential counts of the spironemata showed: *Sp. buccale*, 51 per cent; *Sp. medium*, 11 per cent; and *Sp. dentium*, 38 per cent. Here, again, the relations are in close agreement with the relative numbers found in preparations from the healthy mouth. Swab cultures in serum agar and in serum broth were made and examined after twelve days' incubation.

In the preparations made from the serum broth cultures spironemata were not detected. In those made from the serum agar culture many spironemata were present.

A differential count gave: *Sp. buccale*, 20 per cent; *Sp. medium*, 31 per cent; *Sp. dentium*, 49 per cent. Subcultures made in serum agar, and

examined nine days later, showed: *Sp. buccale*, 14 per cent; *Sp. medium*, 58 per cent; *Sp. dentium*, 28 per cent.

Subcultures from this examined after six days showed: *Sp. buccale*, 8 per cent; *Sp. medium*, 47 per cent; *Sp. dentium*, 45 per cent.

Subcultures from this examined after nine days showed great numbers of spironemata, especially in the tubes of agar + 0, and entanglements were very common (fig. 36).

Differential counts gave: *Sp. buccale*, 8 per cent; *Sp. medium*, 49 per cent; *Sp. dentium*, 43 per cent, or practically the same relations as in the previous subculture.

Several further subcultures were made, and the spironemata continued to be very numerous, but the other organisms also seemed to be holding their own, and there was never a suggestion of any approach towards pure culture of spironemata. Noguchi, Mühlens, and Hartmann and Shmamine obtained their pure cultures apparently in more liquid medium. It is possible that better results may be obtained with less firm agar—say two per cent and a higher percentage of serum. M. and H. used thirty-three per cent serum.

All the subcultures were characterized by an exceedingly offensive odour—which was not characteristic of those cultures in which the spironemata were not present. It seemed probable that the odour was due to the presence of the spironemata.

(3) Pte. P., *Vincent's angina*. Preparations from the swab from the fauces showed enormous numbers of spironemata, this contrasting with the previous two cases in which these organisms may now be considered as relatively few in number (figs. 34 and 35).

Differential counts gave: *Sp. buccale*, 70 per cent; *Sp. medium*, 6 per cent; *Sp. dentium*, 24 per cent, an excess of *Sp. buccale*, as compared with the healthy mouth and the two cases of gingivitis.

A number of swab cultures were made in serum agar, but, on examination, after twelve days' inoculation, spironemata could not be detected.

In swab culture in serum broth of the same date a few *Sp. buccale* were found after a long search; and in a subculture in serum broth examined ten days later a few *Sp. buccale* were found; the other varieties were not seen. It would seem that no growth of spironemata had occurred, and that the few *Sp. buccale* that were seen were survivors from the original swab.

The patient had been treated just before the swab was taken with peroxide lotion, and it is possible that this may have in some measure inhibited the cultivation of the spironemata.

In serum agar plates colonies of *B. fusiformis* were grown, but it was not possible to obtain them in pure subculture.

We are indebted to Dr. P. Laidlaw, of Guy's Hospital, for the photographs of the spironemata.

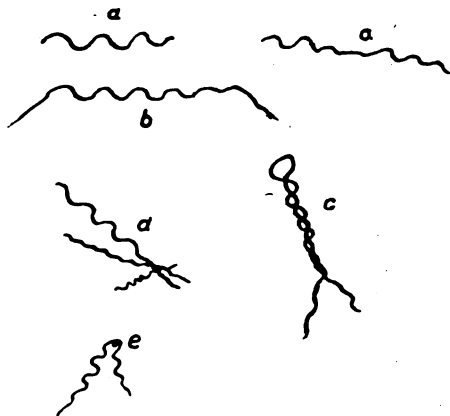


FIG. 1.—(a) *Spironema buccale*; (b) *S. buccale*, showing terminal wisps; (c) *S. buccale*, twisted on itself; (d) *S. buccale*, entangled with two other spironemata; (e) *S. buccale*, bent over a coccus.

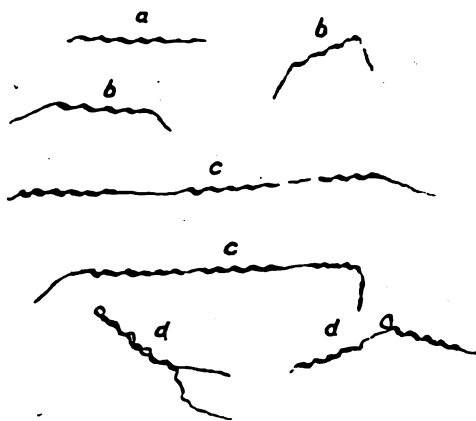


FIG. 2.—(a) *Spironema medium*; (b) *S. medium*, showing terminal wisps; (c) *S. medium*, long forms with straight, unwaved intervals; (d) *S. medium*, twisted forms.

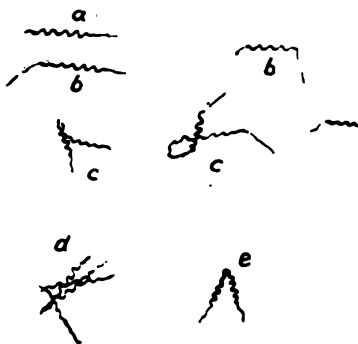


FIG. 3.—(a) *Spironema dentium*; (b) *S. dentium*, showing terminal wisps; (c) *S. dentium*, twisted forms; (d) *S. dentium*, entanglement; (e) *S. dentium*, bent over a coccus.

(VII) *BACILLUS FUSIFORMIS* IMMUNE BODIES (AMBOCEPTORS).

If the *B. fusiformis* is a causal organism of Vincent's angina and other allied ulcerated conditions of the mouth and gums, there should be evidence of corresponding amboceptors in the serum of convalescent patients. Similar amboceptors should also be found in the serum of normal persons in whose mouth fusiform bacilli are present.

Serum was obtained from a patient who was recovering from Vincent's angina, and also from a normal person in whose mouth *B. fusiformis* could be demonstrated in stained films.

(A) patient's serum; (B) normal person's serum.

Experiment 1.—A mixture containing equal volumes of (1) serum A inactivated; (2) emulsion of *B. fusiformis* (surface colony from culture in semi-solid medium); (3) fresh normal guinea-pig serum was incubated at 37° C. for eighteen hours. To this was then added: one volume of twenty per cent dilution in normal saline of rabbit's washed corpuscles sensitized with inactivated anti-rabbit serum (making a five per cent dilution of rabbit's corpuscles). The mixture was placed in an incubator at 37° C.

Result.—No hæmolysis after three hours. After the addition of a small quantity of fresh guinea-pig serum complete hæmolysis occurred in less than one hour.

Experiment 2.—Identical with Experiment 1, serum B being used in place of serum A.

Result.—The same as in Experiment 1. (N.B.—The strain of *B. fusiformis* used in these experiments was isolated from a "clean" mouth).

Experiment 3.—Control of anti-rabbit serum. A mixture of equal volumes of inactivated anti-rabbit serum and of a fifteen per cent dilution, in normal saline, of rabbit's washed corpuscles was incubated at 37° C. for twenty minutes. One volume of fresh guinea-pig serum was then added and the mixture placed at 37° C.

Result.—Complete hæmolysis in thirty minutes.

Experiments 4 and 5.—These were repetitions of Experiments 1 and 2, using another strain of *B. fusiformis* which had been isolated from a case of gingivitis. The complement absorption was allowed to take place at room temperature for eighteen hours previous to the addition of the sensitized rabbit's corpuscles.

Result.—The same as in Experiments 1 and 2.

Experiments 6 and 7.—Sera from two healthy persons, in whose mouths fusiform bacilli were demonstrated, were tested against strains of *B. fusiformis* isolated from a case of acute gingivitis. The complement absorption took place at 37° C. for twenty minutes before the addition of the sensitized rabbit's corpuscles.

Results.—No hæmolysis after three hours at 37° C. On the addition of a small quantity of normal guinea-pig serum complete hæmolysis occurred after twenty minutes at 37° C.

REMARKS.

The absence of hæmolysis at the end of three hours shows that in these experiments the complement was absorbed from normal guinea-pig serum when in contact with the inactivated serum and emulsion of fusiform bacilli. This absorption of complement could only have taken place after sensitization of the *B. fusiformis* with its immune body.

That hæmolysis took place on the addition of a small quantity of fresh serum from a normal guinea-pig shows that the corpuscles were sensitized, and would have hæmolysed at the previous stage of the experiment had complement been available.

It is evident from these experiments that *B. fusiformis* immune bodies are present in the serum of persons convalescing from "Vincent's disease," and also in the serum of healthy persons in whose mouths the presence of fusiform bacilli can be demonstrated.

These immune bodies were absorbed equally well by strains of bacilli from two different sources, viz., from acute gingivitis and from a clean mouth.

No attempt was made to standardize the complement and antigens used; the object was merely to test whether the complement in a serum suitable for the lysis of sensitized red corpuscles was absorbed when placed in contact with *B. fusiformis* and the inactivated serum examined.

It is to be regretted that the time at our disposal did not permit of further investigations on the subject. It would be interesting to test the sera of patients during the early stages of Vincent's angina and acute ulcerative gingivitis, and again at varying dates of convalescence; also to test the sera of normal persons with *B. fusiformis* in their mouths. Several strains of *B. fusiformis* might be used for the tests, and it would be necessary to standardize the dilution of complement and antigen (*B. fusiformis* emulsion) used, so as to obtain a measure of the amboceptors present.

The bactericidal effects of the serum on *B. fusiformis* and mouth spirochætes should also be tested.

Further information on these points would probably explain why Vincent's disease and acute ulcerative gingivitis are comparatively rare diseases, notwithstanding the fact that fusiform bacilli are so universally present in the mouths of those who have teeth, whether the teeth are in good or bad condition.

These facts suggest that a man's resistance as indicated by the presence of immune bodies is his greatest safeguard against the disease.

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PLATE I.

B. fusiformis. (Pure Colonies.)



FIG. 1.

Anaerobic Plate Culture (Krumwiede's Method).

1. Six days old.

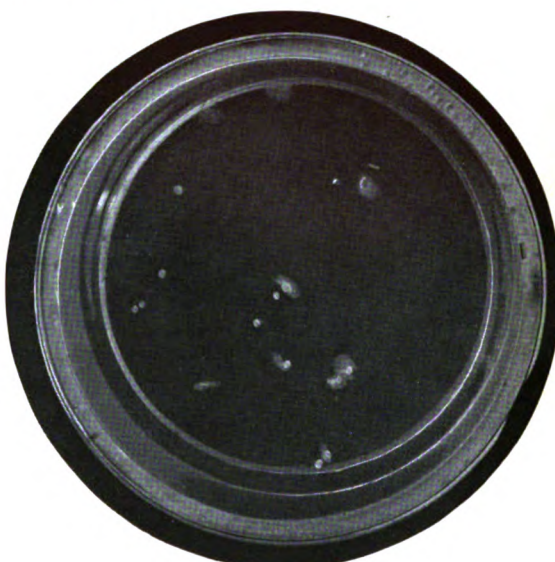


FIG. 2.

2. The same. Nine days old.



FIG. 3.

Anaerobic Plate Culture (Krumwiede's Method).

Sixteen days old.

PLATE II.

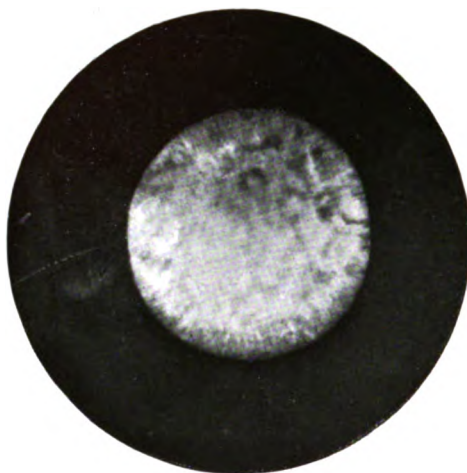


FIG. 4.

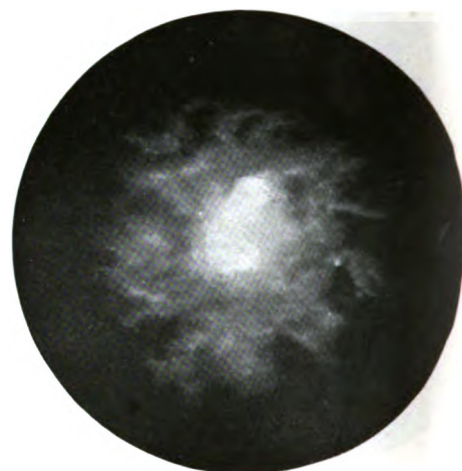


FIG. 5.

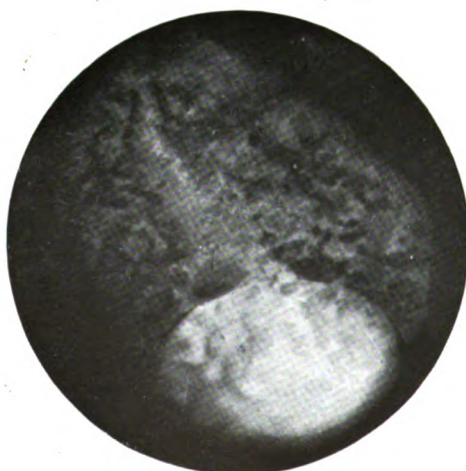


FIG. 6.



FIG. 7.

Single Colonies of *B. fusiformis* $\times 25$ times.

To illustrate "A Report for the Pathological Committee of the War Office of an Inquiry into Gingivitis and Vincent's Disease occurring in the Army," by Lieutenant-Colonel Sir DAVID SEMPLE, R.A.M.C., Captain CECIL PRICE-JONES, R.A.M.C., and Miss L. DIGBY.

PLATE III.



FIG. 8.
10 days.

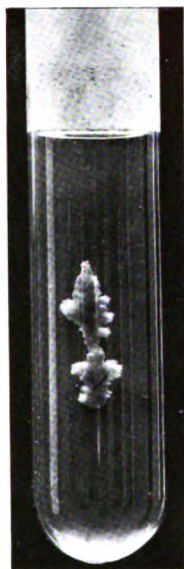


FIG. 9.
The same, 20 days.

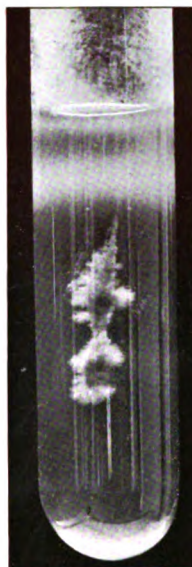


FIG. 10.
The same, 44 days



FIG. 11.
6 days.



FIG. 12.
The same, 10 days.

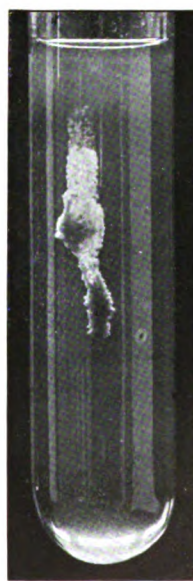


FIG. 13.
The same, 19 days.

Stab Cultures of *B. fusiformis* in Semi-solid Medium.
(Peptone-serum-agar-gelatin Medium.)

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PLATE IV.

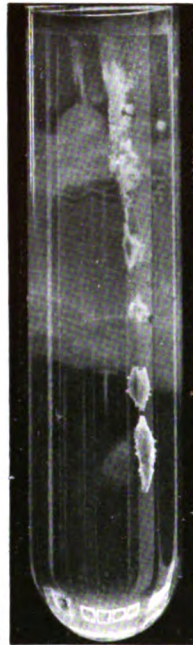


FIG. 14.
9 days.
Stab showing cloud.



FIG. 15.
7 days.
Stab showing cloud.



FIG. 16.
2 days.



FIG. 17.
2 days.



FIG. 18.
4 days.



FIG. 19.
8 days.
From clean mouth.

B. fusiformis.
Stab Cultures in Semi-Solid Medium.
(Peptone-serum-agar-gelatin Medium.)

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PLATE V.

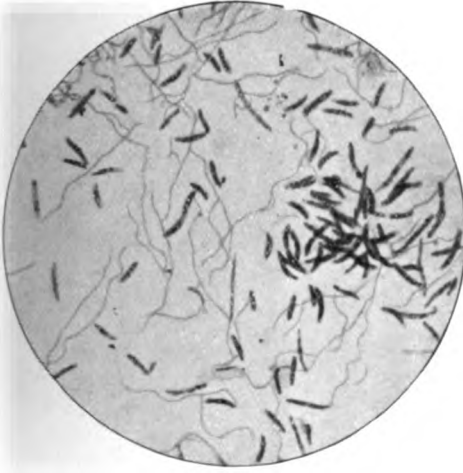


FIG. 20.



FIG. 21.



FIG. 22.

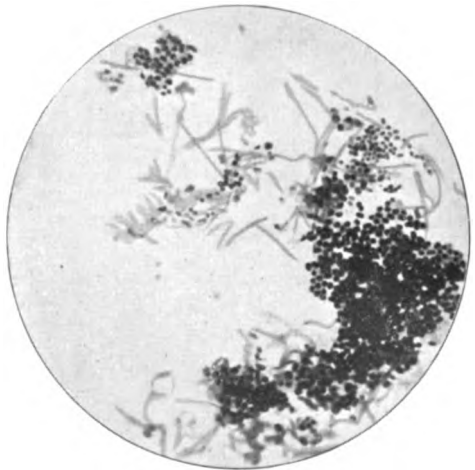


FIG. 23.

To illustrate "A Report for the Pathological Committee of the War Office of an Inquiry into Gingivitis and Vincent's Disease occurring in the Army," by Lieutenant-Colonel Sir DAVID SEMPLE, R.A.M.C., Captain CECIL PRICE-JONES, R.A.M.C., and Miss L. DIGBY.

PLATE VI.



FIG. 24

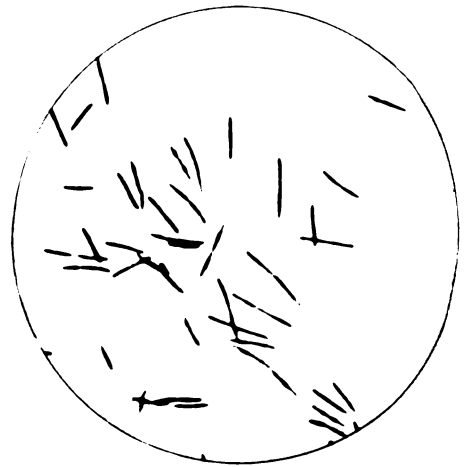


FIG. 25.



FIG. 26.

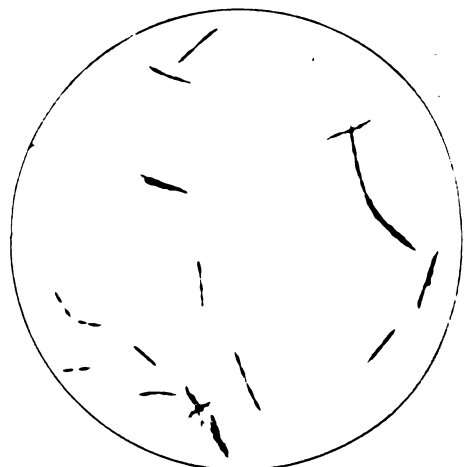


FIG. 27.

Photomicrographs of *B. fusiformis* \times 1,000.

To illustrate "A Report for the Pathological Committee of the War Office of an Inquiry into Gingivitis and Vincent's Disease occurring in the Army," by Lieutenant-Colonel Sir DAVID SEMPLE, R.A.M.C., Captain CECIL PRICE-JONES, R.A.M.C., and Miss L. DIGBY.

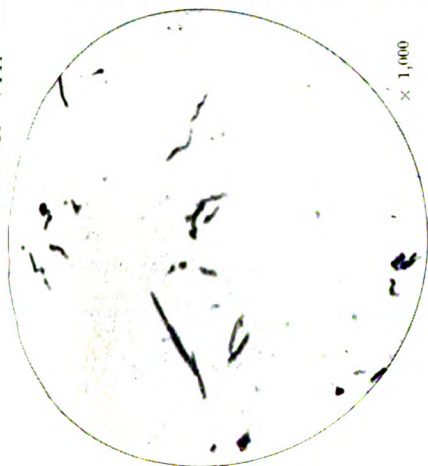


Fig. 30.

× 1,000

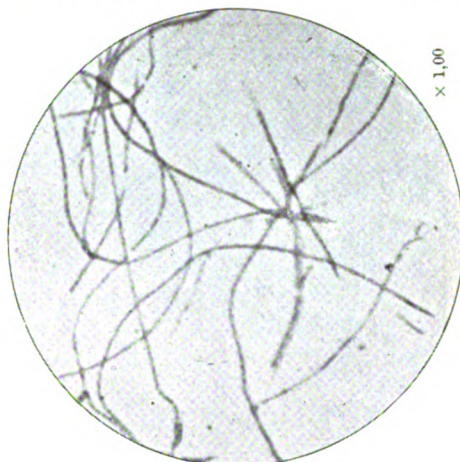
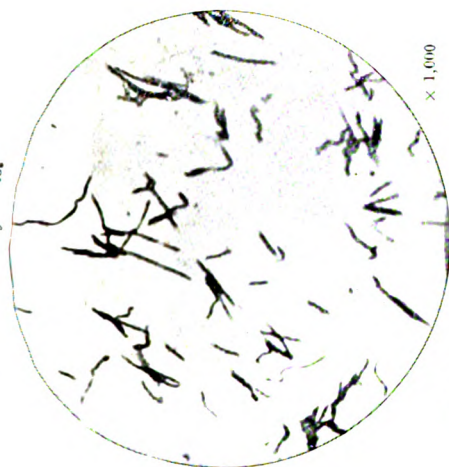


Fig. 33.

× 1,000

× 1,000



Spirillum forms.

Fig. 29.

× 1,000

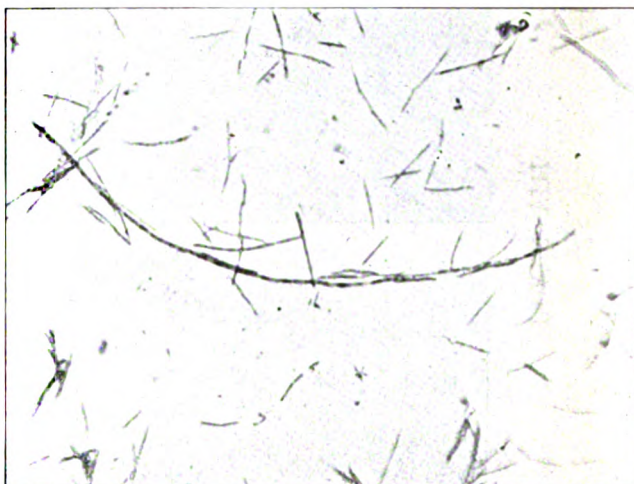


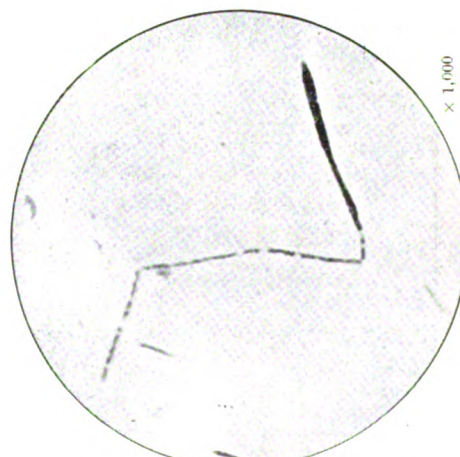
Fig. 31.

× 1,000



Fig. 28.

× 1,200



To illustrate "A Report for the Pathological Committee of the War Office of an Inquiry into Gingivitis and Vincent's Disease occurring in the Army," by Lieutenant-Colonel Sir DAVID SEMPLE, R.A.M.C., Captain CECIL PRICE-JONES, R.A.M.C., and Miss L. DIGBY.

PLATE VIII.

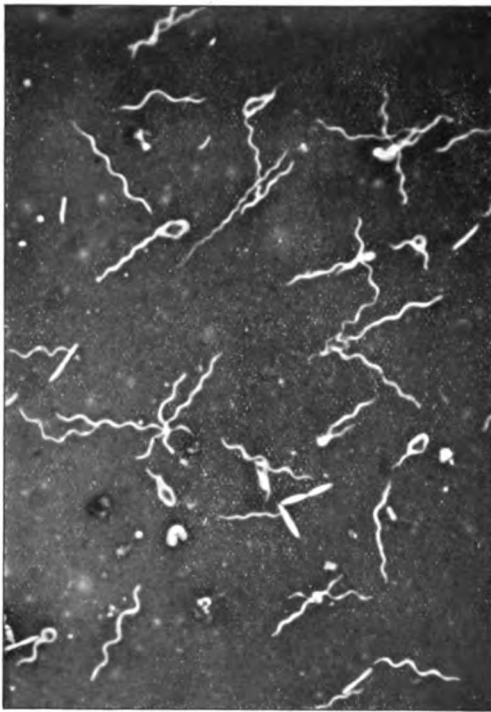


FIG. 35.

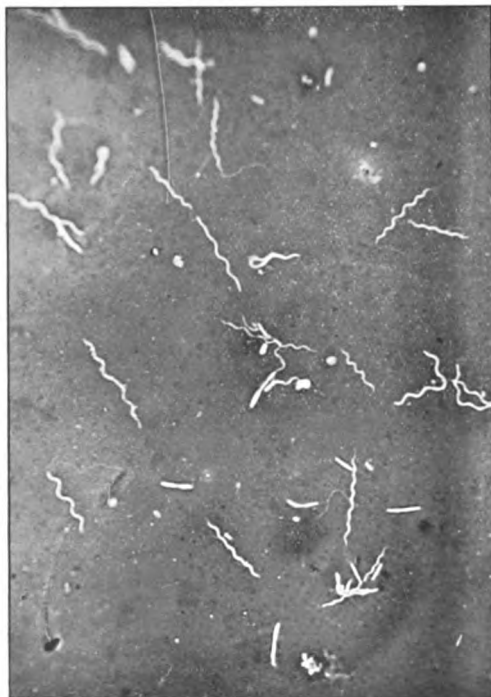


FIG. 34.



FIG. 38.



FIG. 37.



FIG. 36.

To illustrate "A Report for the Pathological Committee of the War Office of an Inquiry into Gingivitis and Vincent's Disease occurring in the Army," by Lieutenant-Colonel Sir DAVID SEMPLE, R.A.M.C., Captain CECIL PRICE-JONES, R.A.M.C., and Miss L. DIGBY.

- [30] WEAVER, G. H., and TUNNICLIFF, R. "The Occurrence of Fusiform Bacilli and Spirilla in Connexion with Morbid Processes." *Journ. Infect. Diseases*, 1905, vol. ii, pp. 446-59,
[31] *Idem*. "Noma (Gangrenous Stomatitis), Water Cancer, Scorbutic Cancer, Gangrena oris, Gangrene of the Mouth." *Ibid.*, 1907, vol. iv, pp. 8-35.

DESCRIPTION OF PLATES.

We are indebted to Mr. W. B. Randles, B.Sc. (Technical College, Derby) for the photographs and photomicrographs of *B. fusiformis*, and to Dr. P. Laidlaw for the photomicrographs of figs. 24, 34, 35, 36, 37 and 38.

PLATE I.

FIG. 1.—Anaerobic serum agar plate culture (Krumwiede's method) of *B. fusiformis* showing a "golf-ball" type of colony; some of the colonies are surrounded by a cloud. Six days old. (Natural size.)

FIG. 2.—The same. Nine days old. (Natural size.)

FIG. 3.—Another plate culture (Krumwiede's method) of *B. fusiformis*. Sixteen days old. (Natural size.)

PLATE II.

FIG. 4.—"Golf-ball" like colony of *B. fusiformis*. Three days old. ($\times 25$.)

FIG. 5.—"Mat-like" colony of *B. fusiformis*. Six days old. ($\times 25$.)

FIG. 6.—"Golf-ball" like colony with a cloud of *B. fusiformis*. Three days old. ($\times 25$.)

FIG. 7.—"Golf-ball" like colony with a cloud of *B. fusiformis*. Eleven days old. ($\times 25$.)

PLATE III.

FIG. 8.—Stab-culture of *B. fusiformis* in the "semi-solid" medium. Ten days old. (Natural size.)

FIG. 9.—The same, showing the commencement of feathery outgrowths. Twenty days old. (Natural size.)

FIG. 10.—The same, showing a greater development of the feathery outgrowths. Forty-four days old. (Natural size.)

FIG. 11.—Stab-culture of *B. fusiformis* in the semi-solid medium. Six days old. (Natural size.)

FIG. 12.—The same. Ten days old. (Natural size.)

FIG. 13.—The same. Nineteen days old. (Natural size.)

PLATE IV.

FIG. 14.—Stab-culture of *B. fusiformis* in the "semi-solid" medium showing a cloudy zone extending round the inner surface of the tube. Nine days old. (Natural size.)

FIG. 15.—Another stab-culture of *B. fusiformis* in the "semi-solid" medium showing a cloudy zone. Seven days old. (Natural size.)

FIG. 16.—Stab-culture of *B. fusiformis* in the "semi-solid" medium. Two days old. (Natural size.)

FIG. 17.—Stab-culture of *B. fusiformis* in the "semi-solid" medium. Two days old. (Natural size.)

FIG. 18.—Stab-culture of *B. fusiformis* in the "semi-solid" medium. Four days old. (Natural size.)

FIG. 19.—Stab-culture of *B. fusiformis* (isolated from a healthy mouth) in the "semi-solid" medium. Eight days old. (Natural size.)

PLATE V.

FIG. 20.—Direct film from a case of Vincent's angina showing "typical" forms of *B. fusiformis*. ($\times 1,000$.)

FIG. 21.—Direct film from a case of Vincent's angina showing "giant" forms of *B. fusiformis*. ($\times 1,000$.)

FIG. 22.—"Typical" forms of *B. fusiformis* from a six days old colony grown in a serum agar plate (Krumwiede's method) from the throat of a Vincent angina case. Stained carbol-fuchsin ($\times 1,000$).

FIG. 23.—Film from serum broth mixed culture from the emulsion of a swab from the gums of a case of gingivitis, showing *B. fusiformis* and staphylococci. Stained Gram ($\times 1,000$).

PLATE VI.

FIG. 24.—Pure culture of *B. fusiformis* from a young "semi-solid" stab. Stained Heidenhain's hæmatoxylin ($\times 1,000$).

FIG. 25.—Pure culture of "typical" forms of *B. fusiformis* isolated from a case of gingivitis. Stained carbol-fuchsin ($\times 1,000$).

FIG. 26.—Pure three days old serum broth culture of *B. fusiformis* isolated from a gingivitis case. Stained Giemsa ($\times 1,000$).

FIG. 27.—Film of "typical" forms of *B. fusiformis* from a five days old colony grown in a serum agar plate (Krumwiede's method.) The colony consisted of both "typical" and "leptothricial" forms. Stained carbol-fuchsin ($\times 1,000$).

PLATE VII.

FIG. 28.—"Wavy" forms of *B. fusiformis* from a four days old colony grown in a serum agar plate (Krumwiede's method). Stained carbol-fuchsin ($\times 1,200$).

FIG. 29.—"Wavy" forms of *B. fusiformis* from a six days old colony grown in a serum agar plate (Krumwiede's method). Stained carbol-fuchsin ($\times 1,000$).

FIG. 30.—"Wavy" forms of *B. fusiformis* from the same colony as fig. 28. Stained carbol-fuchsin ($\times 1,000$).

FIG. 31.—An "intermediate" leptothricial form of *B. fusiformis*, showing a deeply staining broad terminal portion, from a six days old "intermediate" colony grown in a serum agar plate (Krumwiede's method) from a healthy mouth. The "intermediate" colony consists of bacilli intermediate in character between the "typical" and leptothricial" forms. Stained carbol-fuchsin ($\times 1000$).

FIG. 32.—"Intermediate" leptothricial forms of *B. fusiformis* from the same colony as fig. 31. Stained carbol-fuchsin ($\times 1000$).

FIG. 33.—"Leptothricial" forms of *B. fusiformis* from a five days old gelatinous colony (in a serum agar plate, Krumwiede's method) grown from a healthy mouth. Stained carbol-fuchsin ($\times 1,000$).

PLATE VIII.

FIG. 34.—Congo-red film from swab of Vincent angina \times (circa) 1,000.

FIG. 35.—Congo-red film from swab of Vincent angina \times (circa) 1,400.

FIG. 36.—Entanglement of spironemata (fourth subculture on serum agar). Congo-red film \times (circa) 1,400.

FIG. 37.—*Spironema medium*, from healthy mouth showing terminal "wisps." Congo-red film. ($\times 1,000$.)

FIG. 38.—*Spironema medium*, fifth subculture on serum agar showing terminal "wisps." Congo-red film. ($\times 1,000$.)

TRYPANOSOMIASIS IN THE EAST AFRICAN CAMPAIGN.

BY LIEUTENANT-COLONEL NEWHAM, C.M.G.

Royal Army Medical Corps.

Consultant in Tropical Diseases, East African Expeditionary Force.

IN the course of a military campaign in Tropical Africa, it was only to be anticipated that a considerable amount of sickness due to those diseases, which are of common occurrence in the tropics, would have to be contended with.

Amongst these malaria, dysentery (both amœbic and bacillary) and relapsing fever have furnished the vast bulk of the sickness met with among the troops and porters engaged in the East African Campaign.

Further, considering that operations were frequently taking place in areas known to be infected with trypanosomiasis, it was expected that instances of this disease were fairly certain to occur. However, although active operations have been in progress since 1914, it was not till March, 1918, that any instance of this disease was encountered. It is quite possible that unrecognized cases of this disease may have occurred before this date, but it is hardly likely that many can have occurred without suspicion as to their true nature being engendered.

At the same time it should be pointed out that operations in the earlier part of the campaign were conducted in parts of the country not known to be infected, and it was not until the troops reached the southern part of German East Africa, in the later part of 1917, and were close to the Rovuma river, that they were fighting in an area definitely known to be infected.

GEOGRAPHICAL DISTRIBUTION.

Very little accurate knowledge is available as to the exact distribution of the disease in German East Africa, nor has much detailed work been done on the types of *Glossina* to be met with, or their areas of distribution been properly delimited.

Before the war the Germans had investigated these points to a limited extent. Thus Dr. Marshall writes in 1908, that there were two foci of sleeping sickness on Lake Victoria, and one on Tanganyika. The disease had also been discovered on the islands Bumbire, and Iroba, and on the mainland of Ihangiro, opposite to them. The fly had not been found at the Kagero river, nor on the shore of the Lake near its mouth. *Glossina palpalis* was found widely distributed on the shore of the lake, and on the rivers in the Shirati district, and sleeping sickness was very prevalent there.

Cases of the disease had also been found on Ukerewe Island. As for the distribution of *G. palpalis* on the Lake there were only a few points at which the presence of this fly could be excluded.

The conditions on Tanganyika were worse even than those prevailing on the Shirati coast. The large rivers Malagarasi and Rusisi were fly haunted. At Urundi the percentage of infection was between sixty and ninety. Of 200 natives examined at Kirando (eighty miles north of Bismarckburg) fifteen were infected.

In 1910 Wolf met with a case of trypanosomiasis, which came from the Rovuma river near its junction with the Sassawara river. In 1911 an extraordinary mortality of the natives in this area was reported, and on investigation this was found to be due to trypanosomiasis.

Following on this discovery search was made for tsetse, and Wolf reports "In spite of every search being made it was not possible to find in any part of upper Rovuma area the *G. palpalis*. After painstaking searches, it was established, that the *G. morsitans* is the transmitter of the Rovuma sleeping sickness in this area, and that the trypanosome shows characteristic peculiarities from the *Trypanosoma gambiense*. The trypanosoma of the Rovuma is identical with the *T. rhodesiense* discovered about 1909 by English physicians."

Professor Beck, as a result of his investigations, stated that eight to ten per cent of the *G. morsitans* in the Rovuma area were infected with trypanosomes.

Wolf in his report, further states "German doctors who have worked on the Rovuma consider it certain, that the principle source of infection is to be sought in the thickly populated districts of the Lugenda Valley, and especially in Kumembe (Ngomano). The Lugenda river flows through the Portuguese Colony in a north-easterly direction to enter the Rovuma near Ngomano. In 1917 five cases of sleeping sickness were identified in the hinterland of Kilwa on Lake Kiwlimira. Here there are no *G. palpalis*, so that *G. morsitans* must be accepted as the transmitting agent. It agrees likewise to the *T. rhodesiense*. I believe that the sleeping sickness from the Rovuma area or the Portuguese territory has been carried past Liwale."

From these few extracts of German writers it would appear that the known infected areas in German East Africa are the southern border of Lake Victoria Nyanza, the vicinity of Lake Tanganyika, and the neighbourhood of the Rovuma river (which forms the boundary between the German and Portuguese Colonies), from Sassawara on the west to Liwale on the east.

Practically nothing was known before the war as to any infected areas in Portuguese East Africa. As has been shown above, the German doctors were confident that the Portuguese border of the Rovuma river was infected, but I can find no records of any investigations by the Portuguese authorities to ascertain the distribution of the disease in their territory.

In the course of military operations undertaken by us in Portuguese territory it became necessary to open up certain long lines of communication, and of these a line running from Port Amelia through Anquabe, Medo

Balama to Lucinje was the first. It was from this line that the first case of trypanosomiasis to be met with among the troops was derived. From a consideration of the history of this case, and of the other four cases of the disease in white men which subsequently occurred, it will be seen that infection in at least four of the cases must have been contracted between the coast and Anquabe, a distance of some forty-five miles up the line.

The Port Amelia line started from Bandari on the opposite side of the bay to Port Amelia itself, and ran first to Mahiba, a distance of fourteen miles, and thence to Anquabe, a further distance of some thirty miles. Thence it ran on to Medo, Balama, etc.

From Bandari to Anquabe the road runs the whole way through fairly thick bush. Several small streams run across this road, but in the dry weather dry up, though possibly pools may be left here and there where the streams run through the bush. On the occasion of my visit to this area the streams were dry, and I had no opportunity of following them up through the bush. Tsetse-flies were encountered in moderate numbers along the road, but were only noticed at Mahiba, and for a distance of some seven miles beyond this place in the direction of Anquabe. Captain McGregor, attached R.A.M.C., has investigated the fly of this area, and reports that he met with *G. morsitans* and *G. pallidipes*, but never saw a specimen of *G. palpalis*. *G. pallidipes* was by far the more common variety. He comments on the great variation in the numbers of flies encountered from day to day on this road. Usually the flies were in moderate numbers, but on one occasion he was attacked by veritable swarms. Other observers also have commented on the great variation in the numbers of flies encountered. One officer informed me that he had traversed this stretch of road without seeing a single fly, though he was on the look-out for them. In numerous journeys up and down this road McGregor first met flies at about seven miles from Bandari, and from that point to Anquabe they were met with here and there as far as Anquabe itself, the chief belt being for about six to seven miles extending from Mahiba in the Anquabe direction. Flies are known to occur beyond Anquabe, but no exact work on their distribution has been done. It is of interest to note that on this particular stretch of road between Bandari and Anquabe wild animals are extremely scarce, and, moreover, there are practically no natives living on this road, except a few at Mahiba and Anquabe. I am informed however, by officers who have penetrated the surrounding bush, that at a distance of about two miles from the road game is to be found in fair numbers, and it is presumably from this source that the flies derive their infection.

Another line of communication in Portuguese territory ran from Lumbo on the mainland opposite Mozambique in a direction practically east and west through Nampula towards Lake Nyassa.

McGregor informed me that he had never met with any fly between Lumbo and Nampula. The Army Veterinary Officers reported that beyond Nampula the fly belts are very extensive and reach to Lake Nyassa, and

that a great deal of trypanosomiasis exists in horses and cattle. Numerous specimens of flies sent to McGregor from this area were identified by him as *G. morsitans*, *G. pallidipes* and *G. fusca* in order of prevalence. One case of trypanosomiasis in a native was discovered at Lumbo, but it was impossible to ascertain where he had contracted the infection.

Recently McGregor has investigated the distribution of flies in the Lindi area. He reports, that as far as Lindi itself is concerned, tsetse are rare. He himself was not able to obtain any specimens here, but he had the opportunity of examining several specimens which had been obtained previously, and identified these as *G. pallidipes*. It was reported to him that both *G. palpalis* and *G. morsitans* had been captured some time before, but as the specimens had been lost their identification could not be confirmed. The general impression he gained was, that though tsetse might occasionally be found in Lindi itself they were undoubtedly scanty at the best of times.

The country immediately surrounding Lindi was described by him as being in many places typical "tsetse" country. Although at the time of his investigation he was only able to catch one living specimen of glossina, which proved to be *G. pallidipes*, in this area he saw several others, and from questioning natives and others he ascertained that tsetse were reasonably common in this district at certain times of the year, usually just after the rains. Captain McGregor next proceeded to investigate the distribution of fly on the road from Lindi to Ngomano on the Rovuma at its juncture with the Lugenda river, and also on the road branching off the Lindi—Ngomano road at mile 108 and proceeding to Tunduru.

Summarizing his investigations he states:—

(1) From Lindi to Ngomano and Tunduru, four species of glossina have been found, viz., *G. morsitans*, *G. pallidipes*, *G. fusca* and *G. brevipalpis*.

(2) *G. morsitans* is far and away the most common of the species, except in the Lindi area, where *G. pallidipes* is the common species, at any rate at this time of the year (November).

(3) Species of *G. fusca* were taken near Mtua, and a male and female *G. brevipalpis* were seen near Luanda on the Tunduru road.

(4) No very sharply defined fly-belts occur anywhere on the line, but there are places where the flies are especially numerous, and other places where the fly does not seem to exist—to be qualified again by saying at this time of the year (November).

(5) The points at which the fly has been found to be especially bad are:—

(a) Between Chirimaka and Mtua; (b) between miles 127-130 on the Ngomano road; (c) between miles 134-139 on the same road; (d) seven miles from Ngomano on the Chomba road, in Portuguese territory; (e) between miles 25-30 on the same road; (f) between miles 125-127 on the Tunduru road; (g) between miles 193-196 on the same road.

Flies can however be found in varying numbers between most of these points.

(6) The parts of the line apparently free from tsetse are :—

(a) From Mtama to Ndanda; (b) from Ndanda to Massassi; (c) from Massassi (mile 93) to mile 108; (d) from a point 6 miles east of Tunduru to Tunduru itself.

(7) The percentage of glossina infected with a species of trypanosome is high, averaging about 11 per cent. At one place however, on the Chomba road, seven out of seventeen flies carried trypanosomes.

(8) No cases of human trypanosomiasis were seen anywhere on the line. Among the post-commandants at the different posts, the political officers, and others, there seems a general belief that sleeping sickness exists. I have met no one, nevertheless, who can give a reason for holding this belief, beyond saying that they "have heard it said," and that "the Germans reported it."

(9) None of the natives or native Jumbes (chiefs) whom I met knew of, or were able to recognize from my description, a disease among them which would point to trypanosomiasis.

(10) I conclude, therefore, that if it exists at all in the areas I have visited, cases must be very rare indeed, and that if there is an endemic centre along the Rovuma, it must be higher up than I was able to get under present conditions.

ETIOLOGY.

It is obviously very difficult indeed to arrive at any estimate of the duration of the period of incubation. It has been suggested by Manson that the actual infective bite in many cases is accompanied by more than usual pain and irritation, which may persist for several days.

Certainly I have seen several cases of the disease from other parts of Africa in which a short time before symptoms of the disease appeared the patient was bitten by tsetse, and remembered one particular bite which caused an excessive amount of irritation, or even severe pain, more intense than had ever been experienced before.

I have made careful inquiries on this point from the five white men who contracted the disease here. Of these only S——n and M——n can remember any particular bite. S——n stated that he had very frequently been bitten by tsetse, and knew the sensation well. On February 25, 1918, he was bitten on the shoulder, and this caused very severe pain lasting for some hours, and was so marked that he asked a comrade to put some iodine on it. On March 2 he was taken ill with what proved to be trypanosomiasis. If we accept this bite as being the infective one, then the period of incubation in this case is of five days only.

In the case of M——n he remembered having been bitten on the lip about a fortnight before he was taken ill. This caused great pain and swelling.

Further, from experiments in monkeys, carried out by Captain Hughes, I.M.S., it was shown that infection in those animals was very readily

obtained by injection of the patient's blood containing trypanosomes. The parasites could be detected in the monkeys in six to seven days, and death in two cases took place on the twelfth day, and in a third case on the seventh day after inoculation.

From these data I am inclined to think that the incubation period is a short one, somewhere between five and fourteen days.

The parasite, as seen in human blood, is a polymorphic trypanosome indistinguishable morphologically from *T. gambiense*. In all cases it occurred in fairly large numbers, and was readily found in the peripheral blood.

Examination of the patient's blood in the living state showed auto-agglutination, especially marked in the case of L—n.

Experiments on rats showed that infection of these animals was readily induced by direct inoculation from man to animal, the period of incubation averaging six days, the rats surviving on the average about twelve days.

Subinoculations from rat to rat followed much the same course, but in none of these experiments on rats were there any true posterior nuclear forms encountered.

On two occasions in inoculated monkeys forms were seen in very scanty numbers approaching the so-called posterior nuclear forms described as occurring in subinoculations of *T. rhodesiense*. These forms were only observed on one day in each case, and although there was considerable dislocation of the nucleus of the parasites, it was never so far displaced as to get behind the micro-nucleus.

I am inclined to consider, however, that the parasite is probably identical with *T. rhodesiense*, or, at any rate, very closely related.

It is true that in our hands the parasite never yielded post-nuclear forms in rats, and only on two occasions in monkeys, but from the rapid way in which animals could be directly infected from man, its marked virulence in them, its non-amenability in man to atoxyl treatment, and the fact that no *G. palpalis* occur in the areas where the disease was contracted, render it highly probable that we have to deal with *T. rhodesiense* rather than with *T. gambiense*.

From the consideration of the following table it will be seen that altogether we have had eighteen cases of the disease, of whom five of the patients were white men, whilst the remainder were natives. This list does not quite exhaust the number of cases which have been recognized, as some five other cases in natives have occurred in various parts of the country, but as they did not come through our hands, and no details as to their condition or the results of treatment are available, we have not included them in the above table. The place of infection in the case of the white men has been easy to determine, as full particulars as to the area in which they were employed are available. Thus S—n, who was a motor driver, worked on the Port Amelia line between Bandari and Anquabe, and was never in any other fly area.

TABLE I.

	Name	Place of infection	Result
Europeans	S—n	Port Amelia Line	Evacuated to South Africa. Died.
	M—n	" "	Reported "rapidly" sinking. "
	L—n	" "	Evacuated to England.
	M—k	" "	Under treatment.
	C—k	? Lugenda Valley	
Natives	Boki (1)	Port Amelia Line	Under treatment. Doing well.
	Mikambo (2)	" "	
	Dorakani (3)	" "	Died from acute tick fever with pulmonary symptoms.
	Bikali (4)	" ?	Under treatment. Doing well.
	Somiba (5)	" ?	Was doing very well till he got pneumonia following influenza and died.
	Munguma (6)	Port Amelia Line	Under treatment. Doing well.
	Inwalo (7)	" "	
	Haminsi (8)	" "	Was doing well till he contracted pneumonia following influenza and died.
	Nigeria (9)	" ?	Under treatment. Doing well.
	Mehago (10)	" ?	Was doing well till he contracted pneumonia following influenza and died.
	Opengo (11)	Port Amelia Line	Died of dysentery shortly after admission to hospital.
	Singali (12)	" "	Died shortly after admission.
	Oroni (13)	" "	" " "

M—n was employed in the Road Corps, and worked on the same stretch of road as S—n.

L—n also was in the Road Corps, and was employed with M—n on the same piece of road.

Both these men had never worked in any other fly area. M—k, who was a dispatch rider, also worked between Bandari and Anquabe. It is true that for a time he had also been farther up the line where tsetse occurred, but a consideration of his case seems to show that the place where he was infected was undoubtedly the same as where the other three derived their infection.

C—k does not appear to have been infected on the Port Amelia line. Up to October 3, 1918, beyond a few attacks of malaria he had kept well. His last attack of malaria was at the beginning of August. On October 3 he started to march from Lucinje to Ngomano, crossing the Lugenda river on October 9, and arriving at Ngomano on October 15. On the night of his arrival at the latter place he had fever. This ran a more or less irregular course, and he was transferred to Lindi where, on his blood being examined, trypanosomes were found.

I regard it as highly probable that infection in this case took place on the march from Lucinje to Ngomano, i.e., in the valley of the Lugenda.

It is noteworthy, that on this march C—k was accompanied by a force of some 2,000 to 3,000 men, and yet he was the only one to be infected. The blood of every man in the force was examined microscopically on arrival at Lindi, and none were found who showed the infection, nor has any case of the disease since arisen amongst these men.

In endeavouring to ascertain where the native cases became infected, one is at once confronted with great difficulties. Most natives have very little idea where they have been. Their ideas of time, distance and loca-

tion are hazy in the extreme. When asked what places they have visited only a very few of them can remember the names of such, and frequently they have no idea of the name of the port at which they disembarked, or from which port they have come, when they re-embarked for the base. It is almost an impossibility to trace their movements from official records. A few of them are reasonably intelligent and can give sound information, but with the majority of them very little information of any value can be obtained. All these native cases were evacuated through Port Amelia, and would therefore have been working on that line, with the exception of the German porters. Of these native cases Nos. 1, 2, 7, 9 give a fairly clear history of having been employed between Bandari and Anquabe and nowhere else on this line, and the inference is very strong, therefore, that it was somewhere between those two places that they derived their infection. Of the cases No. 3, 11, 12, 13, who died shortly after admission to the Carrier Dépôt Hospital at Dar-es-salaam, beyond the fact that they were employed on the Port Amelia line, no information as to their movements is available.

Cases 4, 5 and 10 were German porters, who were taken prisoners from Von Lettow about 200 miles up the Port Amelia line. They had marched with that redoubtable commander over a very large part of both German East Africa and Portuguese East Africa, and it is therefore impossible to say where they were infected. They were under treatment by the Germans for trypanosomiasis when captured.

Cases 6 and 8 can give no information of any value as to their movements, and beyond the fact that they were employed on the Port Amelia line no further information is available.

The date of onset of the disease could only be ascertained in the cases of the white men. With the onset of the initial fever they all thought they had malaria, and it was only later, when their blood was examined, that the true nature of the illness was detected.

It is utterly impossible to say in the cases of the natives when their illness started. The cases with the exception of the German porters were only diagnosed by routine blood examination, when they were admitted to hospital, and it is impossible to say how long the disease had existed in them before they reported sick and came into hospital.

In considering the results of the cases it will be seen that, as far as the white men are concerned, they are bad.

S—n did badly from the first. He never stood the treatment adopted at all well, it was never found possible to increase the doses of antimony up to a point sufficient to control the fever and the parasites, he lost heart, and when evacuated to South Africa where his home was, was undoubtedly a doomed man. His death was reported as occurring in South Africa in August, 1918. The total duration of his illness was a little over five months, but no details of the manner of his death have been received.

M——n also did badly. He was unable to stand the antimony in sufficient doses and died five and a half months after the commencement of his illness, but no details as to the manner of his end are available.

L——n at first did fairly well. The fever appeared to respond favourably to the antimony administered, but he too was unable to stand a sufficient dosage to completely control the fever and parasites. He has slowly got weaker, and latest reports show that a fatal result is to be anticipated.

M——k, on the other hand, did well from the beginning. One was able to push the antimony up to the maximum dosage, and although when he left this country the fever was not completely controlled, he was much better and there is every hope that with a continuance of the treatment in England he should have a good chance of complete recovery.¹

C——k has only been under treatment for a very short time. He is not standing the antimony injections well, and is extremely anæmic, so that one is not able to give a very favourable prognosis.²

The native cases on the other hand appear to respond well to treatment. They were all treated at the Carrier Dépôt Hospital at Dar-es-salaam.

Of the cases that died, in none of them could the cause of death be ascribed to trypanosomiasis alone. No. 3 died a few days after coming in of very acute relapsing fever.

This case is of particular interest in that the patient had marked ascites due to extensive cirrhosis of the liver. His blood showed numerous spirochætes and trypanosomes. Examination of the ascitic fluid withdrawn during life showed large numbers of trypanosomes therein, but no spirochætes. No. 5 died of pneumonia, following influenza. He had been free from trypanosomes in his blood for over three months, and had showed no signs or symptoms of the disease during that time. No. 11, 12, 13, died within a day or two of being admitted to hospital at Dar-es-salaam. Two of these suffered from pneumonia, whilst the other was the subject of profound anæmia, due to ankylostomiasis and dysentery, and was practically moribund when admitted.

No. 10 was extremely lethargic when admitted, and it was thought that the trypanosomiasis had progressed to the sleeping sickness stage. Spinal puncture was performed, but no parasites were found in the fluid withdrawn. He was found, however, to be the subject of marked ankylostomiasis, which undoubtedly was the cause of his lethargy, as under treatment with thymol the lethargic condition rapidly disappeared. He, however, succumbed later to pneumonia, following influenza.

¹ I have since ascertained that this man died of influenza about a month after his arrival in England.

² From a letter received from South Africa dated June, 1919, I have learned that this man has much improved. He has put on weight, stands his antimony treatment well, and parasites are only found in his blood in small numbers and at lengthening intervals.

No. 8 was doing well till he also contracted pneumonia, following influenza, and died.

All other cases at the time of writing are doing well.

SYMPTOMS.

There was a singular absence in nearly all the cases of many of the symptoms usually associated with trypanosome infection. The common symptom was irregular fever associated with a moderate degree of headache, and some lassitude. The white men generally considered that they had got an attack of malaria, whilst in the natives the fever was at first usually ascribed to malaria or relapsing fever. It was only when the cases came under routine blood examination that the true nature of the infecting agent was manifest. The temperature charts in all cases were of an irregular intermittent nature, and showing from time to time exacerbations of the fever associated with increases in the number of parasites in the peripheral blood.

Enlarged Glands.—It has been pointed out that enlargement of the superficial lymphatic glands in the cases of *T. rhodesiense* infection is the exception rather than the rule, and certainly in the cases I have met with here this was well marked.

In only two cases, namely, those of M—n and L—n, was any enlargement of the glands to be detected. In M—n's case only very moderate enlargement of the glands in the posterior triangle of the neck was detected in the first three weeks of his illness. Enlargement of the cervical glands in the case of L—n came on in the later stages of his illness. There was an entire absence of glands of the large "juicy" type so commonly associated with infections with *T. gambiense*. Enlarged glands were never seen in the native cases.

Edema.—As is well known, local œdema of the eyelids or part of the face is by no means an uncommon symptom in trypanosome infections, but such was only met with in the case of C—k, who stated that this had been noted on one or two occasions previous to his coming into my hands. It has not so far been seen by me.

Splenic Enlargement.—No marked enlargement of the spleen was to be noted in any of the cases. Usually it was just palpable, but in one or two cases the organ extended about one finger's breadth below the costal margin.

Rash.—This was only seen in two cases, viz., L—n and C—k. In L—n it appeared on the left side of the chest in the form of two small erythematous rings in about the sixth week of his illness. It was very poorly marked and disappeared in three days' time. It was noted again in his case some three months later.

The characteristic rash was also seen in C—k on his admission to hospital in Dar-es-salaam. It was confined to the trunk, and disappeared in two days' time.

A very careful outlook for the appearance of the rash in the native cases was maintained, but in none of them was it ever detected.

Kerandel's symptom, or deep hyperæsthesia, was met with in M—k's case only. It was present early in the disease, and was particularly well marked over the shins, but gradually got less as the temperature came more under control as a result of treatment.

Heart.—Easily excited rapidity of the heart's action was observed in all cases in the early stages of the disease. In the native cases, the only ones I was able to watch over a considerable length of time, this disappeared as the fever became thoroughly controlled by treatment.

OTHER SYMPTOMS.

More rarely occurring symptoms, such as periostitis and irido-cyclitis, which have been described as occasionally met with in cases of trypanosomiasis were never encountered. In the case of L—n marked swelling of one testicle was noted late in the disease.

TREATMENT.

Atoxyl seemed quite inadequate to control the disease as met with here. In several cases it was given at first in doses of three grains three times a week, but failed completely to check either the fever or the parasites. It is true that it seemed to reduce somewhat the number of trypanosomes in the blood, but it entirely failed to banish them, even temporarily, from the peripheral blood. Chief reliance was therefore placed on injections of antimony (tartar emetic). Some cases were given atoxyl as well, whilst others were treated on antimony alone. It did not appear that the ones in which both drugs were given showed any better results than those in which antimony alone was administered.

The antimony was given by intravenous injection twice weekly, starting with a dose of one grain of the tartar emetic, and working the dose up until $2\frac{1}{2}$ grains were taken twice weekly. The measure of success seemed to be dependent on the ability of the patient to stand this latter dose. Thus in the case of S—n, M—n and L—n, neither of them was ever able to stand a larger dose than $1\frac{1}{2}$ grains, and this proved inadequate to control either the fever or the parasites. If an attempt was made to give a larger dose marked reaction occurred. Usually a severe rigor took place, accompanied by headache, nausea, or in the case of M—n frequent vomiting. Great depression ensued and marked anorexia.

M—k, on the other hand, tolerated the drug well, and he was having doses of $2\frac{1}{2}$ grains twice weekly and standing it well, before being evacuated to England. The native cases tolerated the antimony exceedingly well. Beyond a little coughing at the end of the injection, which passed off in about five minutes, no untoward symptoms were observed and none complained of headache or any other symptoms. In the case of Boki it took practically three months of treatment on these lines before the trypanosome condition was thoroughly under control; no trypanosomes were found in the blood after this time in spite of daily examinations for

a further period of over three months, when a relapse occurred, and the parasites again appeared in the blood for two days, and slight fever occurred. The dose of antimony was then increased to three grains twice weekly, which caused no inconvenience.

Other native cases followed much the same course. They mostly took about two months treatment before the disease could be said to be under control, and three of the cases showed a subsequent relapse at intervals of one to two and a half months. Whenever a relapse occurred after a considerable interval of freedom from parasites, the dose of the drug was at once increased to three grains twice weekly, and one and all stood this very well. The cases were all controlled by daily blood examinations of thick films.

An interesting point of these native cases is that in practically every one of them relapses of benign tertian malaria occurred from time to time. Frequently when the trypanosomes were well under control, when none had been found in the blood for several weeks, and the patient was receiving the full doses of antimony, a sudden rise of temperature would take place suggesting a relapse due to trypanosomes, which, on blood examination, would prove to be due to a benign tertian infection.

This phenomenon was seen in ten of the native cases. Further, Cases 1 and 3 showed infection also with *Sp. duttoni*. As has been stated, Case 3 died of acute tick fever with the blood crowded with spirochætes, and with severe pulmonary involvement.

Case 1—Boki—showed numerous relapses due in many instances to spirochætes, and on other occasions to benign tertian parasites. These cases are of marked interest as showing how ineffectual tartar emetic is either against *Sp. duttoni* or benign tertian parasites. In spite of prolonged and maximum dosage with tartar emetic, these parasites continued to thrive, and from time to time manifest their presence, causing a rise of temperature.

PROPHYLAXIS.

As will be seen from the foregoing, undoubtedly the chief focus of the disease we had to deal with was on the Port Amelia line, between Bandari and Anquabe. It is remarkable that, with the continuous movement of troops and porters which was taking place along this line, more people were not infected.

As soon as the first case of the disease was discovered, measures were taken as far as was possible to protect the men. Clearing of the bush on both sides of the road was quite impracticable.

The area was much too large, and would have entailed an enormous amount of labour over a long time to make any impression, and such labour was not obtainable. Steps were therefore taken to protect as far as possible the regular users of this road, such as motor drivers, dispatch riders, road corps men, etc. Veils were served out to protect the head and neck, the use of shorts was forbidden, and balm oil was issued for the frequent anointing of the hands and bare parts of the arms.

MENINGOCOCCUS CARRIERS.

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THERE were 905 carriers investigated at the Netley cerebrospinal fever centre between September 29, 1916, and April 26, 1919. The earlier period from 1914 to September 1916 is not included in this paper, for although the work was performed by the same bacteriologist, the meningococci found in the nasopharynges of the carriers were not proved by serological tests, cultural and sugar reactions only being relied upon. In this paper, no organism has been accepted as a meningococcus unless it agglutinated with the standard sera supplied by the central cerebrospinal fever laboratory (Lieutenant-Colonel Gordon) and not with normal sera.

The subject of carrying in cases and contacts of cerebrospinal fever is discussed in this paper under the following heads:—

- (1) Acute and chronic carriers.
- (2) Treatment of carriers.
- (3) Mechanism of elimination of the meningococcus.
- (4) Non-agglutinable? meningococcus colonies.
- (5) Bacterial replacement of the meningococcus.

(1) ACUTE AND CHRONIC CARRIERS.

The technique adopted for the examination of the carriers was as follows: A weekly examination of the carriers was made except in those cases actually under a prolonged course of treatment. Cases under nasopharyngeal treatment were not examined within twenty-four hours of the last application of antiseptic. Swabbing was performed with a stiff brass wire (gauge 18) which was wrapped with a thin pledget of cotton wool for its last inch. This last inch was bent nearly at a right angle with the rest of the wire. The tongue was depressed with the handle of a tablespoon, and the bent end of the wire carried as far up behind the soft palate as possible. Firm pressure was applied to the posterior nasopharyngeal wall with the wire, which was finally withdrawn, great care being always observed to avoid touching the tongue, mouth, etc.

The swabs very rarely showed any blood stain, but if a second swab were taken immediately after the first it was always found stained with

TABLE I.

	Weeks.												Lunar Months.																								
	1-7 days	8-14 days	15-21 days	22-28 days	29-35 days	36-42 days	43-49 days	50-56 days	57-63 days	64-70 days	71-77 days	78-84 days	85-91 days	92-98 days	99-105 days	106-112 days	113-140 days	141-168 days	169-196 days	197-224 days	225-252 days	253-280 days	281-308 days	309-336 days	337-364 days	365-392 days	393-420 days	421-448 days	449-476 days	477-504 days	505-532 days	533-560 days	561-588 days	589-616 days	617-644 days		
Total remaining "Healthy Carriers."	819	743	632	481	372	324	257	202	165	149	139	123	111	104	99	92	85	71	52	47	43	32	16	15	11	9	7	7	5	4	8	3	1	1	1	1	
i.	19	35	43	31	12	22	21	14	7	7	4	4	2	2	2	0	1	4	2	4	6	5	0	1	1	1	0	0	0	0	0	0	0	0	0	0	
ii.	48	63	71	71	32	39	31	20	5	9	4	8	5	3	5	7	11	13	3	0	5	11	1	3	1	1	0	1	1	0	2	0	0	1	0	1	
iii.	4	8	10	2	2	6	0	3	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
iv.	5	10	17	5	2	0	3	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Discharged ...	76	121	141	109	48	67	55	37	16	16	10	12	7	5	7	7	14	19	5	4	11	16	1	4	2	2	0	2	1	0	2	0	0	1	0	1	
Total remaining "Case Carriers."	86	86	86	86	86	85	85	82	75	73	70	65	63	63	61	59	58	49	41	30	22	18	16	13	9	8	6	3	1	1	1	1	1	1	1	0	
i.	0	0	0	0	0	0	2	2	1	3	2	0	0	2	1	1	5	1	8	2	0	1	2	2	0	0	2	0	2	0	0	0	0	0	0	0	0
ii.	0	0	0	0	0	0	0	4	1	0	3	2	0	0	0	0	4	5	2	5	4	1	1	2	0	2	1	0	0	0	0	0	0	0	0	0	0
iii.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
iv.	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
Total Discharged ...	0	0	0	0	1	0	3	7	2	3	5	2	0	2	2	1	9	8	11	8	4	2	3	4	1	2	3	0	2	0	0	0	0	0	1	0	
Grand Total Discharged	76	121	141	109	49	67	58	44	18	19	15	14	7	7	9	8	23	17	16	12	15	18	4	8	4	3	2	3	1	0	2	0	1	0	1	1	

blood. The pressure exerted did not cause appreciable discomfort, the wire being always preferred to the "West swab" by the patient. Petri dishes containing trypsinized ox-heart legumin hæmoglobin agar (prepared according to Lieutenant-Colonel Gordon's formula) were brought warm to the swabbing room, they were lightly inoculated on the surface with the swab, spread at once with a glass spreader, and transferred as soon as possible while still warm to the incubator. Twenty-four hours later two likely colonies were picked off and subcultured. These subcultures, if found to be Gram-negative cocci, were both then subjected to agglutination with the standard serum. If either or both cultures gave a positive agglutination, the case was regarded as still a carrier. No carrier was discharged until he had two consecutive negative examinations at a week's interval.

In the case of carriers of over three months duration, owing to the discovered intermittency of carrying, three consecutive negative weekly examinations were required before discharge. In this paper a carrier has been considered to cease carrying from the day on which the first of the terminal negative examinations is discovered.

Of the 905 carriers examined, eighty-six were carriers after an attack of cerebrospinal fever (case carriers). Eight hundred and nineteen had never suffered from the disease but had been found to be carriers after an examination of the nasopharynx (healthy carriers). The types of the meningococcus and the length of time that these patients remained carriers are set forth in Table I.

The first or upper part of this table is devoted to "healthy carriers," the second or lower half to "case carriers." Opposite to the Roman figures denoting the type of meningococcus recovered from the nasopharynxes are given the number of carriers who became free from infection during the period noted at the head of the column. Opposite to the "total remaining" heading are given the number of carriers still remaining infectious at the commencement of the period denoted at the head of the column. Opposite to the "total discharge" heading are given the number of carriers who became free from infection during the period noted at the head of the column.

In order to demonstrate the rate of discharge of the carriers graphically, a chart has been prepared (Table II). In this graph the number of carriers remaining infectious at the end of each week has been expressed as a percentage. The "healthy carriers" and "case carriers" are charted separately. The regularity of the "healthy carrier" curve is particularly noteworthy.

On examining Table I it is at once apparent that the discharge rate for "healthy carriers" rises to its maximum in the third week, and drops away week by week until at the end of the eighth week it reaches a steady level.

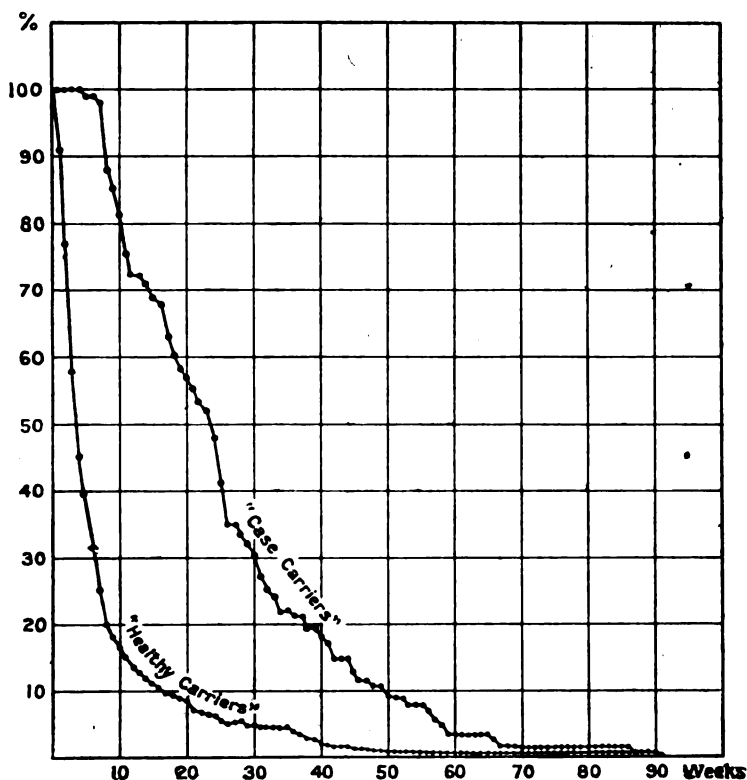
This period of maximum discharge is due to the clearing of the acute

or temporary carriers. It would thus appear that the dividing line between the acute and the chronic carrier should fall at the end of the eighth week.

9.3 per cent. of "healthy carriers" were discharged by the end of the 1st week.

24.1	"	"	"	"	"	"	2nd	"
41.3	"	"	"	"	"	"	3rd	"
56.6	"	"	"	"	"	"	4th	"
68.6	"	"	"	"	"	"	6th	"
79.9	"	"	"	"	"	"	8th	"

TABLE II.



Thus from a batch of 819 "healthy carriers" 79.9 per cent were discharged at the end of eight weeks, 20.1 per cent remaining carriers, so that the proportion of acute or temporary carriers to chronic carriers is as 4 to 1. The average length of time that the acute carriers remained infectious was twenty-four days, the maximum rate of discharge occurred during the third week. The "rate of discharge" appears to be approximately the same for all types of meningococci.

The average time for which the chronic carriers carried, i.e., those of over eight weeks duration, was one hundred and fifty-nine days or five and a half months. The longest time a carrier remained infectious was six

hundred and thirty-four days or one year and eight months; this man carried a Type II meningococcus. The average length of time during which the "case carriers" remained infectious was one hundred and seventy-three days, which is slightly longer than the average carrying time of the "chronic healthy carriers."

In a previous communication (1) we have drawn attention to the fact that it is extremely rare for a "case carrier" to change the type of coccus found in the nasopharynx. Only one case out of 104 was ever demonstrated to have changed type, this change was from a Type I to a Type II coccus. Of 819 healthy carriers investigated we have never found an example of change of type, in spite of close association between carriers of all the four strains of meningococci. This fact we look upon as of considerable importance as it undoubtedly points to the fact that some degree of immunity is established in the carrier, which is specific to type. In making this statement we do not mean to imply that we have never isolated, for example, a Type III coccus from the nasopharynx of a Type II carrier, but that if this did occur a further swab would show that this was accidental or temporary and that the Type II coccus was the real infection. These anomalies were possibly due to some accident, either in marking the colony or plate, or to overlapping of one half of the Petri dish by another specimen, where two swabs had been cultured on one plate. Sometimes it appeared that a change from Type I to Type III, or Type II to Type IV had occurred, a colony giving a greater agglutination to one or other type than usual. It was, however, found that if a saturation test was performed, the original type was shown to be still present. This was found fairly frequently and is easily understood, as the relationship between a Type I and Type III coccus is close, as is also the relationship between a Type II and Type IV. More rarely a carrier was found to have apparently changed from, say, a Type II to a Type I. As an example of this the following Type II carrier can be quoted. This man's coccus agglutinated for several weeks purely to Type II serum, then for several weeks a slight agglutination was also recorded for Type I as well as Type II. He then gave colonies which agglutinated only to Type I serum. It appeared that a change of type had occurred. The coccus that agglutinated to Type I serum was tested by the saturation test and was shown to be a Type II. Thus the apparent change of type was due to an anomalous agglutination and was not real.

(2) TREATMENT OF CARRIERS.

In a previous paper (1) we have detailed in full the methods adopted for the treatment of meningococcus carriers at Netley. It is not necessary here therefore to give more than a summary of these methods. Within twenty-four hours of a case of cerebrospinal fever being proved, all the immediate contacts were swabbed, they were then placed under treatment. In the majority of cases the early treatment consisted in parades

held twice a day, when 1 in 5,000 potassium permanganate dissolved in 0.9 per cent normal saline was sniffed up the nostrils. This treatment was continued until the arrival of a Levick spray apparatus at the camp or until the men found to be carriers were removed to the Netley Carrier Centre. The proved carriers were then vigorously treated twice daily by one of the following methods:—

Inhalation Chamber	Chloramine T. Zinc sulphate.
Hand Spray	Flavine and adrenalin. Chloramine in paraffin. Lecithin in paraffin. Electrosal.
Direct Application	Ferri perchlor. Mercuric ointment.

Each of the above methods can claim a certain number of "cures," inasmuch as it was the last used before the case eventually ceased to "carry"; on the other hand each method has been used in many cases for prolonged periods without eliminating the meningococcus. No method of treatment employed appeared greatly to influence the rate of disappearance of the meningococcus from the nasopharynx. An example of the effect of the Levick spray on a series of carriers who had already carried for six weeks may be quoted.

TABLE III.

Treatment	Dates		Number Treated			Number Discharged
	From	To	Carried over	New	Total	
Chloramine	7/4/17	26/4/17	—	—	23	5
Zinc Sulphate	27/4/17	3/5/17	18	5	23	2
Chloramine	4/5/17	16/5/17	21	6	27	0
Zinc Sulphate	17/5/17	23/5/17	27	0	27	0
Chloramine	24/5/17	23/6/17	27	1	28	0
Zinc Sulphate	24/6/17	18/7/17	28	0	28	2

Seventeen of the above carriers were treated with either chloramine or zinc sulphate from April 7, 1917 to July 18, 1917, a period of one hundred and two days, and were still carriers at the end of this time. Cultures taken from carriers within half an hour of exposure to the Levick spray, when either charged with chloramine or zinc sulphate, frequently showed a pure culture of the meningococcus.

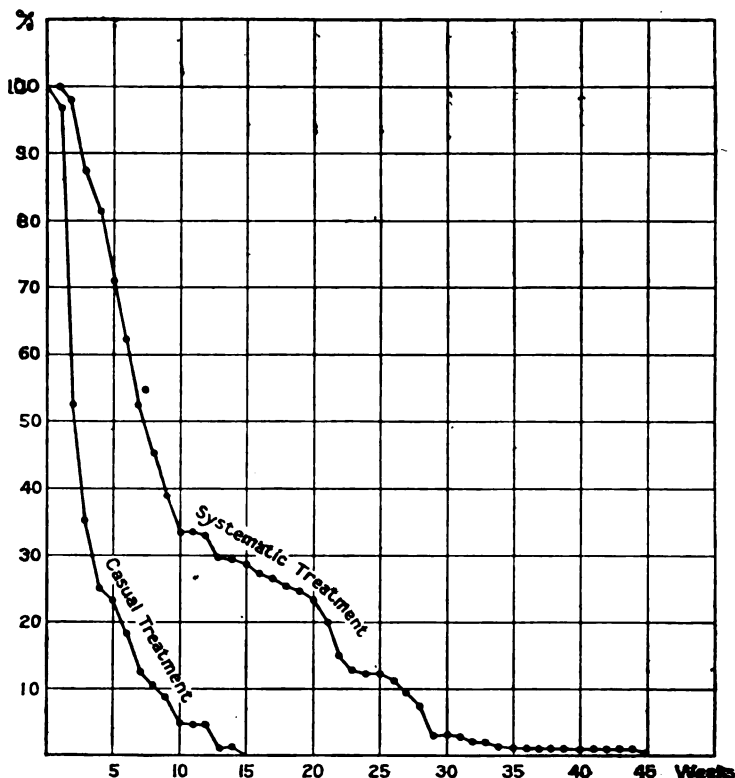
These observations led to the idea that not only were the Levick spray and other intensive methods of treatment of little avail, but that it was possible that they even prolonged the carrying period. It was decided that comparative observations should be made on a large series of carriers to determine whether casual or systematic treatment produced the most rapid clearance of carriers.

All carriers occurring between December 3, 1917 and December 3, 1918, were divided into three groups: (1) Those receiving systematic treatment from the beginning, i.e., Levick spray twice daily or the hand spray charged

with flavine, &c.; (2) those receiving casual treatment, i.e., at most an occasional douching with 1 in 5,000 potassium permanganate; (3) those receiving a combination of (1) and (2). Group 3 cases were few in number and no particular conclusions can be drawn from them. They are, therefore, not further referred to. Group 1 systematic treatment includes 130 carriers. Group 2 casual treatment includes 106 carriers.

In Table IV the number of men remaining infectious is expressed graphically as a percentage.

TABLE IV.



At the end of four weeks, 75.4 per cent of the "casuals" were discharged as opposed to only 18.4 per cent of the "systematically treated." At the end of eight weeks, 89.6 per cent of the "casuals," and 55.4 per cent of the "systematics" were free from infection. In fifteen weeks all the casually treated carriers were free from infection, whereas it took forty-five weeks to clear the systematically treated ones. It is noteworthy in addition that the man who conducted the systematic disinfection was the most prolonged of all the carriers, carrying altogether for 634 days. It would thus appear that vigorous treatment of the nasopharynxes of carriers prevents rather than aids the elimination of the meningococcus. Tulloch (2) also has

suggested that strong antiseptics may be harmful, and retard the clearing of carriers.

(3) MECHANISM OF ELIMINATION OF THE MENINGOCOCCUS.

From the above it would appear that, if careful and accurate examinations of the nasopharynges are made, none of the methods of nasopharyngeal disinfection tried have any appreciable deleterious effect on the meningococcus when once this has invaded the deeper tissue. To what process can one then attribute the disappearance of the meningococcus from the carrier?

In a previous paper [3] it has been shown that the "carrying site" in chronic carriers is extremely circumscribed in area. The upper and anterior parts of the nose are not infected but the infection is limited to: Luschka's pharyngeal tonsil, the fossæ of Rosenmüller, the back wall of the nasopharynx and the faucial tonsils.

There is no doubt that the superficial areas can be dealt with and sterilized, but it appears impossible for the disinfectant to penetrate the deeper structures, i.e., the crypts of the adenoid tissue, or the muciferous glands, and this is quite easily understandable. The mechanism by which the meningococcus is ousted is obscure, it does not appear to us to be in any way connected with the antiseptic, but appears to be ousted by some other bacterium.

It was noticed that if a chronic carrier developed a "cold in the head," he very frequently became free from infection with meningococcus. The area invaded in a common cold is the same area as that inhabited by the meningococcus in a carrier. It was not at all common for carriers to develop "influenza colds," and if one man developed a cold it very rarely spread to others. It was not clear whether this was due to the fact that the carriers were under continuous nasal disinfection, or that they were living an open-air camp life, or that it was due to the fact that the site of infection in the "common cold" was already occupied by another organism (the meningococcus), and this prevented the invasion of the "cold" organism. In the "Spanish influenza" epidemic of June and July, 1918, there were 105 carriers in the camp, of these practically every man was down at one time or another. The symptoms were very typical, and were limited to headache, sore throat and fever, the whole disease being over in three days. The epidemic was not characterized by profuse nasal discharge, and the symptoms were not those usually associated with a common cold. The effect on the carriers was not so pronounced as usual in the way of clearing, but in spite of this, the discharge rate, i.e., the percentage discharged to the total under examination, rose May 20 per cent, June 18 per cent, July 51 per cent, August 50 per cent.

In examining the plates from a series of contacts before any treatment has commenced, it can be observed that the nasopharyngeal plates show

innumerable colonies of many different organisms. As soon as treatment of the nasopharynx is commenced, the total number of colonies appearing is markedly reduced. If a swab be taken within an hour of treatment few, if any, colonies can be obtained, unless sufficient pressure is exerted to squeeze bacteria from the deeper parts of the tissues. While a nasopharynx is under systematic treatment, it is rare to find many different types of organisms present at the same time. Frequently only one type of colony appears, and if there are other organisms present they only appear as a few isolated colonies. This observation leads to the conclusion, that whatever organisms may be present superficially, only one organism as a rule, at a time, inhabits the deeper tissues. Thus in a meningococcus carrier under treatment, the plates week after week show little else than meningococcus colonies, until they cease to appear.

It was noticed that a pigment-producing organism was frequently associated with the disappearance of the meningococcus. It was subsequently noticed that in almost all cases, once this organism had appeared, the meningococcus ceased to appear. The disappearance of the meningococcus did not appear to be due to inability to grow in the presence of this organism, for frequently half the colonies on a plate were typical well-grown meningococcus colonies, which on sub-culture would agglutinate well. As we have stated above, the plates from a chronic meningococcus carrier under treatment usually show few organisms in addition to the meningococcus, many being to all intents and purposes pure cultures. On the appearance of the pigment-producing organism, the usual numbers of colonies appear the same, but the plate is shared between the meningococcus and this organism, usually well in favour of the pigment producer; other colonies do not become more numerous. The following week all or nearly all the colonies may belong to the pigment producer, no meningococcus and few, if any, other colonies appearing. The patient thus appears to have a practically pure infection with pigment producer. No investigation has been made to determine if the carriers ever become chronic carriers of this organism, but in the majority of cases this organism either disappears, or becomes submerged in other organisms, as soon as nasopharyngeal treatment ceases, when a very great increase in the number of colonies and their variety has always been noted to occur. This pigment-producing organism is a Gram-negative rod, which, on meningococcal medium, produces medium-sized moist colonies more opaque than the meningococcus, but less opaque than the staphylococcus. Its characteristic is the blackish-brown smokey appearance it gives to the medium. It is possibly related to the pyocyaneus.

No particular study was made of this organism, as it was soon realized that it was only because of its "eye-catching" pigment-producing property, that it had been recognized at all.

Other organisms were noticed to behave in the same way, for example, a Gram-negative rod giving a large slimy white colony, and a *Staphylococcus albus*. These organisms all had some outstanding feature about their colonies, that rendered them readily recognizable, and it is probable that

this was the reason that they were noticed. There is, however, great difficulty in telling when a man is finally ceasing to "carry," because of the apparent intermittency in carrying which is so noticeable in chronic carriers. It did not appear that there was any particular organism, or group of organisms, that had the power of ousting the meningococcus, but rather that there was some other factor, such as possibly the resistance of the patient to an organism, which permitted the organism to invade the "meningococcus carrying site."

In the majority of carriers the meningococcus thus appeared to be ousted by some other bacterium. Occasionally, however, it is possible that the meningococcus was missed, while still present, owing to the invasion of the "carrying site" by an organism which microscopically was similar, but which gave agglutination with normal as well as specific sera. This organism is now generally known as a "flavus." The flavus may have been replacing the meningococcus, in the same way as the pigment producing organism, or the flavus colonies may have been confused with the meningococcus colonies. This mistake, if it ever occurred, must have been very rare, for flavus colonies were very rarely picked in mistake for the meningococcus. In the last 1,000 suspected meningococcus colonies examined by agglutination test, flavus colonies were only taken in error forty-seven times, or 4.7 per cent. We are inclined to believe that the flavus was ousting the meningococcus, rather than that a mistake between the two colonies was made.

Very frequently towards the end of the time that a man was considered to be a carrier, an organism having the cultural and microscopic appearances of the meningococcus began to appear with frequency, no other alteration in the type of colonies on the plate was apparent. This organism however, refused to agglutinate with any of the standard sera, and thus was not accepted as the meningococcus. Carriers who showed this type of organism were therefore discharged as free from infection. Two typical examples of this phenomenon are quoted.

TABLE V.

A Case Carrier (Th.).—Onset October 10, 1918, carried continuously a Type II coccus until February 3, 1919. Every plate was proved positive and during this time only 11 per cent of his naso-pharyngeal cocci were non-agglutinating. His subsequent examinations were as follows:—

Date of Examination	Plate Report	Agglutination Results		Result Reported
		1st Colony	2nd Colony	
19/2/19	Negative	—	—	Negative
23/2/19	Typical Colonies	Negative	Negative	Negative
4/3/19	Typical Colonies	Weak II.	Negative	Positive
11/3/19	Under treatment for a fortnight			
18/3/19	Pure Culture	Negative	Negative	Negative
26/3/19	Typical Colonies	Negative	Negative	Negative
2/4/19	Typical Colonies	Negative	Negative	Negative
8/4/19	Pure Culture	Negative	Negative	Negative
15/4/19	Typical Colonies	Negative	Negative	Negative

A Healthy Carrier (Mi.).—First found positive Type II coccus March 25, 1918, carried persistently until January 27, 1919; 79·2 per cent of the naso-pharyngeal plates were proved positive, and during this time only 15 per cent of the colonies examined failed to agglutinate. His subsequent examinations were as follow :—

Date of Examination	Plate Report	Agglutination Results		Result Reported
		1st Colony	2nd Colony	
3/2/19	Pure Culture	Negative	"Flavus Agglut."	Negative
10/2/19	Pure Culture	Negative	Negative	Negative
15/2/19	Pure Culture	Negative	Negative	Negative

It has already been stated that it is particularly towards the end of a man's period as a recognized carrier, that these non-agglutinable organisms predominate. And it is chiefly owing to the presence of these organisms that the intermittency of a chronic carrier appears so marked. We believe that in the majority of instances, anyhow, this non-agglutinable organism is the meningococcus.

(4) INVESTIGATION OF THE NON-AGGLUTINATING ORGANISM WHICH RESEMBLES THE MENINGOCOCCUS.

A great deal of work has been done on organisms of this class, the only reason for publishing our observations is that we approach the subject from a different angle.

It was early realized that, from an apparently pure culture of the meningococcus on a plate, many colonies could be picked which would not agglutinate on primary subculture with the standard sera. This can be realized better on examination of Table VI, which includes the last 2,167 plates found positive by agglutination tests; of these 107 represent cerebro-spinal fluids from acute cases, and 2,060 post-nasal swabs from "case carriers" and "healthy carriers."

TABLE VI.

	Total positive plates examined	Pure Cultures					Non-pure Cultures				
		Total positive	Positive in both colonies		Positive in one colony		Total positive	Positive in both colonies		Positive in one colony	
			No.	Per-centage	No.	Per-centage		No.	Per-centage	No.	Per-centage
C. S. Fluids ...	107	107	65	60·7	42	39·3	—	—	—	—	—
Case Carriers ...	365	108	58	53·7	50	46·3	257	134	52·2	123	47·8
Healthy Carriers	1695	499	268	53·7	231	46·3	1196	661	55·3	535	44·7

The number of non-agglutinable colonies varied from man to man and from time to time, some men having few or none, others very many. If these plates had only been derived from the naso-pharynx, it might have

been thought that other organisms having similar colonies were present. But this was not so, as the plates from the cerebrospinal fluid of acute cases, taken with the greatest aseptic precautions, gave similar results, 19.6 per cent of the colonies examined being non-agglutinable.

Again compare the results obtained from pure nasopharyngeal cultures with the results from impure cultures. In the impure culture it would be expected that there would be a greater chance of picking some other organism in mistake for the meningococcus. However, for case carriers, 46.3 per cent of the pure plates and 47.8 per cent of the impure plates had non-agglutinable colonies, for healthy carriers 46.3 per cent of the pure plates and 44.7 per cent of the impure plates had non-agglutinable colonies, showing that the non-agglutinable colony is probably not of extraneous origin.

The non-agglutinable colony does not appear more often in a carrier of any one particular type of meningococcus rather than another, the higher percentage under Type IV can be discounted as an insufficient number of Type IV colonies were examined to get true figures.

TABLE VII.

Type of carriers									Percentage of Non-agglutinable colonies found
I. ...	...	...	...	...	...	...	...	...	23
II. ...	...	...	...	...	...	...	...	...	23.8
III. ...	...	...	...	...	...	...	...	...	21.4
IV. ...	...	...	...	...	...	...	...	...	32.6

(For these figures all colonies showing any group agglutination are excluded, only colonies absolutely monovalent have been counted).

TABLE VIII.

	Examined	Total Colonies		Percentage Colonies	
		Non-agglutinating		Non-agglutinating	
From Case Carriers ...	730	...	173	...	23.7
From Healthy Carriers	3390	...	766	...	22.6
Total ...	4120	...	939	...	22.8

From this Table VIII it appears that about twenty per cent of the colonies taken for examination failed to agglutinate.

From Table VI it can be seen that from a total of 2,060 plates, 557 were positive in both colonies examined and 1,453 in one colony out of two only. It is reasonable to expect that half of the 1,453 or 726 would have been regarded as negative, if only one colony had been examined instead of two. This would have led to only 1,283 plates being regarded as showing meningococci instead of 2,060; and 726 or thirty-six per cent of the plates would have been marked free from infection. Thus it is evident that one subculture from a plate is very unsatisfactory, and if it had been realized by us that the percentage of non-agglutinable colonies was so high, three instead of two colonies would have been subcultured as a routine procedure. We have, however, been in the habit of subculturing six or more colonies in carriers where it was known that non-agglutinable colonies predominated. Many carriers have by this means been proved

to be carriers long after they would otherwise have been discharged on the grounds that no epidemic strains were found.

The non-agglutinable organisms are in many cases very closely related to, if not identical with, the meningococcus. Colonies have been obtained from the cerebrospinal fluid cultures of acute cases which would not agglutinate when first tested. The sugar reactions of these colonies were typical; a saturation test showed that the colonies, though they did not agglutinate in the primary culture, were capable of removing agglutinin from a monovalent meningococcic serum, showing that they really were meningococci. Subsequently after repeated subcultures these non-agglutinable organisms could be made to agglutinate with one of the special type sera.

Many non-agglutinable organisms have been examined also from the nasopharyngeal cultures. In by far the majority of instances we have been able to prove that they were meningococci. A typical example of this can be quoted from a chronic case carrier (Wi) Type I. Five colonies were examined, two serum dilutions are only quoted.

TABLE IX—AGGLUTINATION RESULTS.

No. of Colony	Type of Serum								Normal 1/50
	I. 1/100	1/200	II. 1/100	1/200	III. 1/100	1/200	IV. 1/100	1/200	
1 (1st Subculture ... 12th " ...	— ++	— ++	— +	— —	— —	— —	— +	— —	— —
2 (1st " ... 12th " ...	— ++	— ++	— +	— —	— —	— —	— +	— —	— —
3 (1st " ... 12th " ...	— ++	— +	— +	— —	— —	— —	— +	— —	— —
4 (1st " ... 12th " ...	— +	— +	— +	— +	— —	— —	— +	— —	— —
5 (1st " ... 12th " ...	— ++	— +	— —	— —	— —	— —	— +	— —	— —

Sugar Reactions.—Glucose and maltose were rendered acid by the second day in all five colonies, and saccharose was untouched in four days.

In some instances, although sugar reactions have been typical, we have never been able to obtain agglutinations with the standard monovalent sera, even after prolonged subcultivation. Saturation tests also were unsatisfactory; agglutination, however, could be obtained with a powerful treatment serum such as the M.R.C. pooled Type I and II. We have never felt very certain how to regard these cocci as it has been thought that the agglutination obtained has been due to group agglutinin in the powerful serum, and this might not be evidence that the cocci are capable of producing meningitis. Fildes [4] has drawn attention to the

presence of cocci of this type, where he was able to obtain agglutination with a Flexner serum when agglutination to the four main epidemic types failed.

We have not been able to arrive at the exact percentage of non-agglutinable colonies, which if carried through all the above tests could be subsequently proved to be meningococcus, owing to the enormous labour entailed, but it is certain that a very high percentage of these non-agglutinable colonies are really the meningococcus, which for some reason or other fails to respond at first to the specific agglutinin.

It is interesting that Glover [5] reports that he found a large number of non-agglutinable cocci in the nasopharyngeal plates examined at X depot. The technique for examination of these plates is not given; it would be interesting to know how many subcultures were examined from each plate, as the value of his results would depend upon whether one, two, three or more colonies were subjected to agglutination tests. If his results are based upon the agglutination of one colony per plate, it is probable that if he had examined two or more colonies his carrier rate would have been much higher.

The clearance of a meningococcus carrier is effected either by the replacement of the meningococcus by some other organism, or by some change in the meningococcus whereby it loses its power of agglutinating with standard sera.

(5) BACTERIAL REPLACEMENT OF THE MENINGOCOCCUS.

Attempts have been made to free carriers from infection by the application of cultures of organisms which had been observed naturally to replace the meningococcus in other carriers. In this connexion various dangers have to be considered. It is always uncertain what effect an even apparently non-pathogenic organism may have on an individual, and in any case untoward occurrences following the application might always be attributed to the living organism used. Empyemata of the accessory sinuses of the nose or inhalation pneumonia are serious considerations. The pigment producing Gram-negative rod, which as far as we were then aware was a non-pathogenic organism, was used in one chronic "healthy carrier." The culture was prepared and swabbed over the "meningococcus carrying site." A most severe and alarming diarrhoea followed which lasted for at least a week. That this organism was responsible for the trouble there can be no doubt, as a very carefully prepared pure culture was subsequently used on the same patient again giving rise to the same symptoms; the patient remained a carrier of the meningococcus. The organism evidently did not "take" on the correct site. The above-mentioned possibilities discouraged further investigation on these lines, especially as it was felt that it was the resistance of the patient to the organism, and not the organism itself, which was the determining factor in permitting invasion and replacement of the meningococcus.

In order to see if replacement of the meningococcus would take place naturally more rapidly under no treatment at all, than under systematic treatment, sterile tap water was supplied for use in the nasal atomisers, which were used twice daily exactly as they had been used before. The rate of clearing of carriers per month for five months before the treatment and for three months after treatment had commenced is given below:—

TABLE X.

Months	Percentage of Carriers Discharged					Treatment		
September, 1918	24	...	Nasal Disinfectant Treatment		
October	17	...	..	..	..
November	24	...	..	..	..
December	21	...	..	..	..
January, 1919	12	...	..	..	..
February	46	...	Tap Water Spray		
March	38	...	..	..	..
April	33.3	...	..	..	..

This gives a very striking result, showing as in Table IV. that disinfection does not aid in clearing carriers but prolongs the carrying period. It might be thought that the rate of discharge was influenced by the inclusion of a large number of acute carriers. That this is not so in this case is evident as the total number of fresh carriers admitted from September 1918 to December 1918 was ninety, whereas the total number of fresh carriers from January 1919 to April 1919 was fifty-five. January 1919 is included in the second half, as carriers admitted during this month would influence the February rate of discharge.

We would thus conclude that meningococcus carriers tend to become free from infection more rapidly when not subjected to any of the forms of nasal disinfection investigated, fresh air and exercise being the most beneficial forms of treatment. By this we do not mean to imply that there is no value in nasal disinfection, for in no instance in which nasal disinfection has once been started during an epidemic here has a further case of cerebrospinal fever occurred. This we attribute to the fact that nasal disinfection is capable of destroying bacteria before they have gained access to the deeper tissues. We consider that it is the negative rather than the positive contacts that should receive nasal disinfection, and when once a carrier is discovered, fresh air and exercise should be prescribed.

No mention has been made hitherto of surgical interference with the nasopharyngeal passages. In the first place it is difficult to persuade a carrier to have an operation when no definite promise of a cure can be given. Also there is probably a certain degree of risk of provoking cerebrospinal fever by surgical manipulation of the "meningococcus carrying site."

In a previous paper [3] we have shown that although hypertrophied lymphoid tissue may favour the production of a chronic carrier it is not the only cause of this condition, and no relationship between the degree of

lymphoid hypertrophy and the length of the carrying period could be established. If we accept the idea that the meningococcus disappears from the carrying site when ousted by some other bacterium, it does not seem to us that surgical interference is indicated, because if the meningococcus can invade hypertrophied lymphoid tissue, so can equally easily organisms to replace it.

The authors beg to acknowledge their extreme indebtedness to the Misses M. Stephens and I. Harmer for their able assistance in carrying out the technical details in connexion with this research.

CONCLUSIONS.

(1) Meningococcus carriers can be divided into two groups: (a) Acute or temporary carriers, those carrying under eight weeks; (b) chronic carriers, those carrying over eight weeks.

(2) Acute or temporary carriers remain infectious on an average for twenty-four days; the maximum discharge rate occurs during the third week.

(3) Chronic carriers remain infectious on an average for five and a half months, the longest carrying period found was 634 days, or one year eight months.

(4) Eighty per cent of carriers are acute or temporary—twenty chronic.

(5) The coccus found in the nasopharynx of a carrier does not alter in type throughout the "carrying period." In 905 carriers a change of type was only observed to occur once.

(6) Treatment of the "carrier" appeared to prolong the carrying period.

(7) The meningococcus remains in the "carrying site" until ousted by some other bacterium.

(8) A large number of the non-agglutinable organisms, otherwise indistinguishable from the meningococcus, are probably altered meningococci.

(9) The best method of freeing a meningococcus carrier from infection is open air and exercise.

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ON THE PATHOGENESIS OF DIPHThERITIC PARALYSIS.

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INTRODUCTION.

OF the acute specific fevers in which nervous complications arise diphtheria is that most definitely associated with a clearly defined nervous system-complex.

Post-diphtheritic paralysis in man presents a clinical picture of remarkable constancy and both its pathological and clinical aspects have been extensively studied. In this country, particularly, much light has been thrown on its pathology by the researches of Sidney Martin, Charles Bolton, Rainy and many others, while innumerable observers have so defined its clinical features that it would seem that little remained to be said.

Nevertheless there are still gaps in our knowledge of the subject, and nowhere is this more apparent than when we come to consider the path and manner of infection of the nervous system by the toxin of diphtheria. Nothing definite appears to be known of this and, with few exceptions, an extensive literature does not even indicate the existence of this problem.

Writing in 1909, Guillain and Laroche [9], in a paper on the pathological physiology of diphtheritic paralysis, held that "paralyses in diphtheria were, in the majority of cases, related to the seat of formation of the toxin, and that the nerve centres were attacked by a process of ascending toxic neuritis, similar to the toxic neuritis in tetanus and hydrophobia," and, further, that "morbid anatomy had not afforded any precise evidence as to the pathogenesis of paralysis in diphtheria." Previously, however, in 1904, Babonneix [1] had noted the remarkable relationship existing between the primary diphtheritic lesion and the subsequent paralysis. This, his experiments led him to conclude, was due to an

ascending toxic infection along the peripheral nerves to the nervous centres. He considered, therefore, that as regards its pathogenesis diphtheritic paralysis was comparable with rabies and tetanus.

Rabies and tetanus have long been recognized as toxæmias ascending the nerves. Indeed, the phenomena of "local tetanus" and the spread and generalization of tetanic spasms from the region of the infective lesion made it impossible to escape the inference that the path of infection of the central nervous system was along the nerves.

The whole question of infection along nerve trunks has been made the subject of numerous investigations. These have established the existence of an ascending perineural lymph stream and the infection of the central nervous system by organisms and toxins along this path.¹

In view of the frequency of diphtheritic paralysis and the extent to which it has been studied it is remarkable that the views quoted above have not obtained wider acceptance and notice. The tendency, too, of clinical writers has been to regard the whole picture as one mysteriously peculiar to diphtheritic toxæmia. While the fact that it is at once the only clinical type of polyneuritis characterized by profound and extensive cranial nerve palsies, and the only one definitely due to an infective focus which is exclusively limited to a small region of the body innervated by the cranial nerves that are most involved, has not received the attention its significance merits.

It is important, therefore, to reconsider the pathogenesis of diphtheritic paralysis and to examine the evidence in favour of the hypothesis that it is a toxæmia of the nervous system ascending the nerves innervating the infective focus by their lymph channels.

"LYMPHOGENOUS" INFECTIONS OF THE CENTRAL NERVOUS SYSTEM AND THE PATHOLOGY OF THE NERVOUS SYSTEM IN DIPHTHERIA.

The suggestive work of Orr and Rows [13] on lymphogenous infections of the central nervous system is of the greatest importance in this connexion.

The result of a prolonged series of investigations by these authors has been to confirm the existence of an ascending lymph stream in the perineural sheath of nerves. Toxins and organisms reach the central nervous system by this path and spread in the lymph spaces of the pia-arachnoid and in those in the substance of the cord. Here they give rise to an inflammatory reaction in the connective tissue elements of the cord, to chromatolysis in the nerve cells and to myelin degeneration in the spinal roots. These changes occur in those segments of the central nervous system bearing anatomical relationship to the nerve supply of the infective

¹ It may be noted that an interesting complement to these researches is afforded by Sherrington's observations on the development of strychnine poisoning and its effects on reflex action.

focus. The nerves from this focus show an ascending perineuritis spreading to the cord by the spinal ganglia and spinal roots. It is noteworthy in view of negative findings in the nerves in some cases of diphtheritic paralysis that the myelin degeneration occurs almost exclusively in the intramedullary course of the nerves, i.e., from the point where the neurilemma sheath is lost. Hence it has been assumed that, either the presence of the neurilemma sheath, or, more probably, the peripheral situation of the lymph channels protects the myelin sheaths in the peripheral course of the nerves.

It is not necessary here to discuss the nature of the inflammatory reaction occurring in the fixed connective tissue cells and in the adventitial sheaths of the veins in these infections.

In a series of cases of suppuration in the limbs, trunk and head, Orr and Rows have found an ascending lymph infection of the corresponding nerves giving rise, as described above, to meningomyelitic changes in the central nervous system.

Experimental observations in which gelatine capsules containing cultures of organisms were placed against the sciatic nerve, the spinal dura mater, in the substance of the cheek in animals gave results identical with those obtained from the clinical cases.

Independently, Babonneix [1, 2] arrived at similar conclusions regarding diphtheritic paralysis, as a result of experimental work. By injections of diphtheria toxin subcutaneously into animals he was able to produce local paralysis and acute ascending paralysis of Landry type. He noted a remarkable anatomical relationship between the primary inoculation lesion and the paralysis.

Following injections into the sciatic nerve he found, associated with a local paralysis, an "ascending neuritis" and pathological changes in the lumbar cord; chromatolysis and myelin degeneration in the spinal root fibres. He drew the conclusion that the paralysis in diphtheria followed an ascending neuritis and secondary involvement of the central nervous system.

Oppenheim's [12] views are less clearly formulated though somewhat similar. He says, "the toxin first acts on the nerves in the immediate vicinity of the infective focus; it then passes in the laryngeal and oculomotor nerves and finally becomes still further disseminated." Unfortunately general statements of this type do not help to solve the essential problem of how and by what channels this dissemination occurs, and it is clear that the writer has no definite conception of the pathology of the process.

Oppenheim and most other authors describe a local and a generalized paralysis in diphtheria, referring thus to the cranial and the spinal nerve affections respectively. But if we accept the views of Babonneix that the primary lesion is an ascending neuritis, it is clear that even if we allow such a subdivision of the condition, the differentiation must not be between

spinal and cranial nerve symptoms, but between paralyses resulting from lesions of the nerves innervating the infective lesion focus and those due to lesions of nerves secondarily, or at least otherwise involved. In this second class we should have to include the oculomotor with the spinal nerves, for the third nerves bear no anatomical relationship to the local lesion on the tonsils, and we cannot speak of an ascending neuritis in connexion with it or with the spinal nerves. This preliminary consideration will serve to give us an idea of the complexity of the pathological process with which we are dealing.

The investigations of Babonneix and the views of Guillain and Laroche alone show any evidence of a definite conception of a complete pathology of the condition, while for the rest the literature consists of histological and experimental observations in no way correlated and often conflicting in their results, so that it seems hopeless to expect enlightenment from them. Indeed in a review of the literature in 1900, Rainy [14] draws attention to the numerous divergences of opinion among authors as to the essential pathological lesion. And at first sight it is difficult to account for the lack of agreement as to actual pathological structural changes in a disease so common and so extensively studied. Further work since this review has done nothing to lessen the confusion which renders this chapter of pathology so inconclusive.

Several factors have probably gone to produce this state of affairs. Among these is an omission on the part of observers to discriminate between the pathology of human and experimental diphtheria. When we take into account the very different circumstances of the infection in each case it may be readily conceived that the character of the paralysis and the nature and distribution of the morbid changes in the nervous system may differ, and to compare without qualification the form of the paralysis and the nervous lesion following faucial diphtheria, with those following the intravenous injection of diphtheria toxin into a guinea-pig is to court error and confusion. For a toxin reaching a restricted part of the central nervous system by the lymph channels of certain cranial nerves may surely be expected to produce a different picture clinically and pathologically from that produced when it reaches the nervous system by the blood-stream after intravenous injection.

A further possible source of error lies in the fact that with regard to fatal cases of diphtheria in man in many instances the pathological findings have not been strictly correlated with the clinical phenomena during life. It is difficult to appreciate the significance of pathological changes unless the character and distribution of the nervous symptomatology is known.

For example, a case dying early in the stage of cranial nerve palsies may give different pathological findings from one examined at a stage when multiple neuritis has supervened and the bulbar symptoms have abated. This is especially so, also, when an observer draws deductions as to the whole pathology of diphtheritic paralysis from an examination of the phrenic nerves and the cervical segments of the cord from which it arises;

while another draws equally far-reaching conclusions from examination confined to the medulla and cranial nerves in cases of which no adequate clinical details are available. It is not surprising, therefore, that no agreement has been reached as to the essential nervous lesion in diphtheritic toxæmia. It is possible, too, that the histological methods employed have been directed primarily to detect abnormalities in nerve cells and nerve fibres, without due regard to the fixed connective tissue cells of the central nervous system and its vascular and lymph structures. The importance of studying these inflammatory and degenerative conditions of the nervous system, if a comprehensive and complete picture of the pathology of any infection or intoxication is to be obtained, is known to every neuropathologist and is well exemplified in the work of Orr and Rows.

From what has been said already in connexion with the views expressed by Babonneix and Oppenheim and from these observations it will be seen that the underlying factor in all these possible causes of error is that these numerous researches have not been guided by any clear conception of the pathology of the process by which the nervous system becomes involved.

A COMPARATIVE ANALYSIS OF HUMAN AND EXPERIMENTAL DIPHTHERIA WITH REFERENCE TO THE NERVOUS SYSTEM: THE LOCAL LESION, THE SYMPTOMATOLOGY, THE PATHOLOGICAL CHANGES.

It is therefore important with this hypothesis in view in comparing diphtheritic paralysis in man with that produced experimentally to correlate the seat and nature of the local lesion with the topography of the paralysis and that of the morbid changes in the nervous system. If we do this we find at once a striking parallelism between clinical and experimental diphtheria of the nervous system and in both instances strong evidence in favour of a lymphogenous infection by the peripheral nerves.

(1) *Human Diphtheria.*

(a) *The Local Lesion.*—With the exception of rare cases of wound and cutaneous diphtheria, which will be considered later, the infective focus of the disease in man is constantly situated on the tonsils and fauces, occasionally in the nose and larynx. This extremely circumscribed lesion is innervated by the fifth, ninth, tenth and eleventh cranial nerves. It is not necessary to go into the anatomical minutiae of this innervation. The characteristics of the local lesion resemble very closely those of the capsules of organisms used in the experimental observations of Orr and Rows, from which only toxins diffuse around the nerve.

(b) *The Symptomatology.*—Diphtheritic paralysis in man is ushered in by an extensive cranial nerve palsy,¹ frequently followed in two or three weeks' time by what is clinically a multiple neuritis.

¹ It may be noted that, compared with spinal nerves, these have a relatively short course from the infective focus to their nuclei in the brain stem and, as Orr and Rows have shown, this is associated in cases of lymphogenous infections with relatively more intense reaction in the central nervous system.

This evolution and course are characteristic of the paralysis due to diphtheria and in no other clinical form of polyneuritis is there a cranial nerve involvement at all comparable with the one in the condition under discussion.

It is scarcely necessary here to discuss in detail the symptomatology of diphtheritic paralysis. With regard to the cranial nerve involvement, however, certain considerations are important. It has been noted that of the nerves concerned those innervating the tonsils and fauces are earliest and most severely affected. It has also been pointed out that the third nerve which very commonly shows involvement does not bear any anatomical relation to the local lesion. This fact will come under consideration later. The spinal accessory nerve is not often described as in any way affected, but there is frequently to be observed a profound weakness and tenderness to pressure of both sterno-mastoids during the first stages of diphtheritic paralysis and this may, in all probability, be considered as of the same nature as the other cranial nerve palsies.

It may be stated, therefore, that there is a close anatomical relationship between the nerve supply of the infective focus and the incidence of the paralysis in its initial and most characteristic stage.

(c) *The Pathological Changes.*—In fatal cases of diphtheria Bolton [3] found acute degenerative changes in the medulla; marked chromatolysis in the vagal nuclei, involving the whole cell body and even associated with changes in the cell processes. The vagus nerve he found intact. Whether the degenerative changes noted in the cell processes may be taken to indicate myelin degeneration in the intramedullary course of the vagus is not certain, but negative findings in the peripheral course of the nerve, have, as has been shown in parallel conditions, no significance [13].

The balance of evidence goes to show that in man the medullary nuclei constantly show changes. Of spinal cord changes it is difficult to make any statement on which there is wide agreement, and this perhaps is reasonable evidence of their inconstancy.

On the whole, then, there is a correspondence between the seat of toxin formation and the incidence of the morbid changes in the nervous system.

(2) *Experimental Diphtheria.*

(a) *The Local Lesion.*—A similar analysis of experimental diphtheritic paralysis affords parallel results.

The local lesion is usually a subcutaneous injection into a limb, or less commonly intravenous injections of a selected toxin. The former is not strictly, and the latter is in no way, comparable with the faucial lesion of clinical diphtheria.

With intravenous injections there is no true local lesion, but a blood infection, and this will be considered later.

(b) *The Symptomatology.*—It is interesting to record the nature and distribution of experimental diphtheritic paralysis in view of these facts.

Ransom [15], inoculating the hind limbs of guinea-pigs subcutaneously, records that there are no bulbar symptoms, but the paralysis begins locally in the injected limb and becomes generalized involving the neck and abdominal muscles, but especially those of the hind limbs.

Dean [7] says that, after subcutaneous injections of toxin, paralysis sets in from the fifteenth to the thirtieth days, "The hind limbs are usually first attacked, though sometimes the first signs are apparent in the fore limbs. When the hind limbs are first attacked the paralysis may ascend and affect the trunk and fore limbs."

Crocq [6] states that "Diphtheritic paralysis is distinctly different in man and in the rabbit. In the former it generally begins with involvement of the palate and throat, in the rabbit by weakness of the hind limbs. In man diphtheria seems to produce two different kinds of paralysis in which the one remains localized in the mouth, eyes, nose, larynx and pharynx, while the other is generalized and may affect the whole body, beginning with the lower limbs."

In the same way Bolton [3] says, "it is to be noted that in man muscular paresis in diphtheria most commonly affects the muscles supplied by the cranial nerves, whereas in the rabbit it chiefly affects those supplied by the spinal nerves. It seems, therefore, that in the higher mammals the poison especially attacks the medullary centres and the cranial nerves, and in the lower mammals the spinal centres and spinal nerves."

The conclusions of Babonneix [2] have already been considered.

(c) *The Pathological Changes*.—If we now examine the morbid anatomy of the nervous system we find the same relationships.

Bolton and Bown [4], giving intravenous injections of toxin to rabbits and monkeys, produced chromatolysis in spinal, medullary, pontine and mesencephalic cells.

In rabbits the lower part of the cord was most involved, the medulla, being less affected in them than in monkeys. They found no definite focus of degeneration, and record that the vessels in the nervous system were unaffected. They conclude that "the diphtheria poison directly causes acute degeneration of certain cells of the central nervous system, and that these changes are not secondary to any changes in the circulation, and that the poison directly affects the peripheral nerves."

Dudgeon [8] found no abnormal changes in the medulla in animals, while Crocq [6] states that in rabbits "in the cord the diphtheria poison produces very marked alterations of the grey matter, the cells become swollen, they stain badly, their nucleus and processes disappear; the neuroglia and ependyma proliferate . . . the white substance is but rarely affected. In the peripheral nerves a degeneration is produced. With regard to the medulla slight cell degeneration at its lower part, its middle and upper parts remaining normal. The cranial nerves are not affected by the poison, and a primary myelitis and a secondary peripheral neuritis is produced."

Rainy [14] and Mouravieff [11] completely confirm all these observations, which accord with those of Babonneix [1, 2].

From this analysis the following points have become clear: —

(1) That in both human and experimental diphtheria the evolution and topography of the paralysis and the incidence of the morbid changes in the central nervous system are closely related to the innervation of the infective focus. When, in experimental investigation, intravenous injections have been used we find generalized paralysis from the outset and widespread changes in cord and brain stem.

(2) The apparent differences between the symptoms and morbid anatomy of diphtheritic paralysis in man and in animals respectively have a simple mechanical explanation and depend on the seat of toxin formation, and do not demand for their explanation any speculations as to selective action of the toxin on medullary centres in man on the one hand and spinal centres in animals on the other.

PARALYSIS IN WOUND AND CUTANEOUS DIPHTHERIA : THE ABSENCE OF CRANIAL NERVE INVOLVEMENT : ILLUSTRATIVE CASES.

We have already, therefore, considerable evidence for the belief that in man diphtheritic toxæmia of the nervous system is primarily an ascending infection such as Orr and Rows have demonstrated to occur in infective foci of various types.

If we could bring forward definite cases of wound or cutaneous diphtheria, followed by paralyses, which showed in their evolution and topography evidence of "local sign," i.e., were related to the seat of toxin formation in the matter of its innervation, we should even in the absence of complete post-mortem confirmation, go far to prove the hypothesis.

The records of "wound diphtheria" are from this point of view very disappointing, and may be searched almost in vain for any record of nervous symptoms. Oppenheim [12] indeed briefly mentions two cases of interest in this connexion. In the absence of all details it is perhaps unprofitable to discuss them, but they have a definite bearing on the point at issue and should be recorded. He says: (1) "I have also, in a case of a wound in the forearm infected with diphtheria, seen paralysis of accommodation appear before the paralysis became generalized"; and (2) "That the diphtheritic toxin has first a local effect upon the nervous system is shown by a case in which the paralysis remained limited to the abdominal muscles after diphtheritic inflammation of the umbilicus in a new-born child. Accommodation paralysis may, however, be the first result of an intestinal diphtheria."

It is not easy to draw any conclusions from these observations. The same is true of cutaneous diphtheria, but the only case in which I have found paralytic phenomena recorded falls into line with the views here expressed. The case is described by Bolton and Brewer [5] as follows:—

Case 1.—The patient, a young girl, came first under observation on September 29, 1903, with a sore in the left iliac region and upper part of the thigh, three by two inches in area, and of seven days' duration. It had apparently appeared spontaneously. The lesion yielded typical diphtheria bacilli in pure culture. On October 5, profuse vomiting and albuminuria first appeared. On October 28, the child's general condition was bad, but there was no obvious palsy. On November 1, the patient was observed to be absolutely helpless and unable to move her legs, the upper limbs could be slightly moved. The muscles were flaccid and wasted and the knee-jerks absent. She could swallow, but intercostal and diaphragmatic paralysis was present and she died the same day—the forty-first of the illness.

Pathological examination revealed a practically normal cord and medulla. Vagus, phrenic, and intercostal nerves were all normal. The anterior crural nerve showed an early stage of myelin degeneration. The changes present in other elements in the central nervous system are unfortunately not recorded.

This is an example of a diphtheritic lesion of the skin followed by a severe and apparently flaccid palsy, not associated with any cranial nerve symptoms.

The only definite pathological change recorded in the nervous system is an early myelin degeneration in a nerve definitely associated with the region of infection. Too much stress cannot be laid on this, but the significance of the clinical picture is clear.

Even more significant are the two cases of wound diphtheria now recorded, which have come under my observation, and which may reasonably be considered to complete the clinical proof.

Case 2.—*Post diphtheritic paralysis, first appearing in the right hand and becoming generalized in the spinal nerves and presenting the picture of a multiple neuritis. The condition followed an infected wound of the right thumb received while performing tracheotomy on a fatal case of laryngeal diphtheria. No cranial nerve symptoms.*

On April 19, Captain E. J. B., performed tracheotomy on a patient with laryngeal diphtheria. He was not aware of cutting himself but next morning noticed a painful bleb on the dorsum of the first phalanx of the right thumb. Later, this broke down leaving a sore raw surface, which spread rapidly and became covered by a greyish yellow slough. On April 23, he felt ill and shivery, and there was a marked lymphangitis up the arm and swelling of axillary glands. On April 27, the diphtheria bacillus was isolated from the wound in pure culture and he was admitted to hospital. Antitoxin was given. On April 30, marked symptoms of toxæmia developed, and during the following ten days, albuminuria, periodical vomiting, and cardiac disturbance were present. The knee-jerks

were brisk. Subsequently he improved and early in June was sent to a convalescent home. The keee-jerks were still present. During June improvement continued and he could walk uphill and swim several hundred yards in the sea. On June 25 he resumed duty.

From about the middle of June, he had noticed that the thumb over and round the healed wound was very numb to touch and even to pressure. This impairment of sensation he observed to increase slowly in degree and extent; spreading over the whole hand and up the forearm. During July the right hand became clumsy, writing became difficult and at each attempt his handwriting rapidly became untidy and laborious to continue. In addition, the hand was awkward in all movements and the grasp weak. Simultaneously he began to find going upstairs difficult, his knees felt as if they were going to collapse under him and the legs ached on exertion. Tingling and "pins and needles" sensations then appeared in both feet and also in the left hand. Three days before re-admission to hospital (July 15, 1917) he had to stop writing on account of cramp and loss of control over the fingers. No defect of vision, deglutition or speech.

On examination July 18, 1917: The cranial nerves were perfectly normal. The right arm was definitely very weak and all the fine movements were wildly ataxic, especially with the eyes closed. This ataxy was clearly sensory in type and all the phenomena of loss of position sense were present; falling away of the extended hand, "pseudoathetosis," and error of projection in the finger-nose test when the eyes were closed. The muscles were flabby and all distinctly weaker than those of the left arm, which also showed slight general weakness and some ataxy. Both legs were flabby and very weak, the dorsiflexors were especially affected. To pressure the calves were very tender. Walking was normal in appearance until after very slight exertion when a tendency to drop foot appeared. There was slight Rombergism. The sensory system showed marked changes of the usual peripheral type; impairment of touch, pain, temperature and deep sensibility in the distal segments of the limbs most marked in the extremities. The whole of the right hand was completely insensitive to touch and pin prick and the loss was more profound and extended further up this than up the left arm. All tendon jerks were abolished. Abdominal and plantar reflexes were normal. Heart and urine were normal. After three weeks rest in bed, the sensory and motor symptoms began to recede, but the right arm remained definitely the most affected limb. The tendon jerks had not returned when last examined in August. There was never any trace of cranial nerve involvement.

This case is particularly valuable since the patient himself was a medical officer and a most careful and skilled observer. It constitutes a definite example of an extensive diphtheritic paralysis beginning locally in the inoculated limb and then becoming generalized in the spinal nerves. The cranial nerves were never affected in the slightest degree. The association of this condition with a diphtheritic infection is also certain, and

there would seem little room for doubt that the case is a true lymphogenous ascending infection of the central nervous system along a nerve.

Case 3.—Diphtheritic Infection of a Gunshot Wound of the Lumbar region followed by Peripheral Neuritis, affecting mainly the Lower Limbs and showing no Cranial Nerve involvement.

Pte. H. B., was wounded in the "small of the back" on the right side on April 19. There were two wounds—exit and entry—about six inches apart just above the left buttock on the dorsal aspect. On April 27, the bullet track was laid open for drainage. During May the wound became very septic and sloughs formed on the surface, and in spite of daily eusol dressings and hip baths the wound remained unchanged and covered by greyish sloughs. Sun baths and other devices influenced it but little. During the last week of August while a fairly large raw surface still remained, the patient began to get about more freely and at once complained of numbness and tingling in the feet and the palms of the hands and of weakness and aching in the muscles of the legs. He came under my observation for these symptoms on August 23. Examination revealed a large almost healed scar, 6 inches by $1\frac{1}{2}$ inches, above the left buttock; the skin was adherent, purplish in colour and shiny. At its centre was a small scab showing a pink granulating surface when removed. The nervous system: Cranial nerves were normal. Slight general weakness of both upper limbs and slight sensory ataxy. The legs showed more marked flaccid weakness, with special involvement of the dorsiflexors. The calves were moderately tender to pressure. There was well marked sensory loss over all the extremities of the type seen in peripheral lesions. Position sense was profoundly impaired in the toes and this gave rise to some Rombergism. He could walk but was readily fatigued. The tendon reflexes were abolished in all four limbs. Examination of the wound gave a pure culture of typical Klebs-Loeffler bacillus. Captain L. Hirst, R.A.M.C., made the following report on this:—

Report on a Bacillus isolated from a Swab from Pte. H. B.: "The diphtheroid bacillus present in the primary serum tube was isolated without difficulty in pure culture by plating on agar. Microscopically the organism was typical of a medium-sized Klebs-Loeffler bacillus showing marked beading and characteristic grouping. Gram-positive polar bodies were brought out by Neisser's stain and toluidine blue. The appearance of the colonies on the plate and of the growth on serum and agar resembled that of the diphtheria bacillus.

After incubation for ten days in carbohydrate broth tinted with litmus the reactions were as follows: Acid in glucose and maltose. No change in lactose, saccharose, mannite and dulcite. One cubic centimetre of a twenty-four hours culture in trypsinized broth containing abundant growth was injected subcutaneously into a 400-gram guinea-pig with negative result. This bacillus is, therefore, to be regarded as an attenuated strain of the Klebs-Loeffler bacillus." This well-defined polyneuritis associated

with a diphtheritic infection resembles Cases 1 and 2 in the complete absence of cranial nerve symptoms. There was no local paralysis noted at the onset, but the lumbo-sacral cord clearly bore the brunt of the toxæmia.

MULTIPLE NEURITIS ASSOCIATED WITH "SEPTIC SORES."

Writing on the pathology of barcoo rot, a form of chronic superficial ulceration of the dorsal surface of the hands and forearms occurring in troops serving in the desert and commonly spoken of as "septic sores," C. J. Martin [10] mentions the possibility of diphtheritic infection in connexion with these. The undoubted occurrence of mild polyneuritis in certain men suffering from these "septic sores" is very significant.

During the past nine months eight such cases have come under my observation. Their symptoms and physical signs are remarkably constant and a brief account of one case describes them all.

Case 4.—Company Qmr.-Serjt. G., aged 33, has served in Egypt since the Gallipoli evacuation and has enjoyed perfect health.

Two months ago (July, 1917), he suddenly developed four septic sores on his hands and one just below the head of the fibula on the outer aspect of the left leg. These spread quickly and reached a diameter of $1\frac{1}{2}$ inches before healing, which was also rapid, set in. During the latter half of August he began to notice—the sores being as yet unhealed—numbness in the hands and feet and constant tingling in the fingers and toes. Ten days ago (*circ.* September 6) he noticed difficulty in getting about—weakness, aching of legs and unsteadiness, and slight swelling round the ankles. The left leg was much weaker than the right. He came under my observation on September 15 and showed a well-marked multiple neuritis; weak ataxic limbs, with tenderness of calves and tendency to foot drop. Absent tendon reflexes in all four limbs and the usual sensory loss, in which position sense was most deeply affected. As the sores are always healed when the cases come under the observation of the neurologist a definite proof of their diphtheritic origin is not obtainable. The possibility of beri-beri was considered, but this can be excluded with reasonable certainty. Only in one case (that quoted) was there any history of œdema and the diet of the troops was beyond cavil in all instances. I have little doubt that these will ultimately prove to be cases of true diphtheritic paralysis.

CONCLUSIONS.

There is, therefore, a weight of evidence which may be considered sufficient to justify us in concluding that diphtheritic paralysis, at any rate in the initial and most characteristic of its stages, that of cranial nerve involvement, is an ascending infection of the central nervous system: the toxin elaborated in the membrane passing up to the medulla in the perineural lymph channels of the cranial nerves innervating the tonsils and fauces.

Unfortunately the nature of the morbid changes in diphtheritic toxæmia has not been sufficiently elucidated to enable us to identify them conclusively with the pathological changes occurring in known lymphogenous infections of the central nervous system.

It has already been pointed out that of the cranial nerves involved, one at least, the oculomotor nerve, bears no relation to the infective focus. We cannot therefore in this instance be dealing with an ascending infection of the nerve. A clinical study of the condition makes it seem highly improbable that the mechanism of production of the various cranial nerve palsies is other than a single one.

Very probably it is not the passage of the toxin up in the lymph channels of the nerves that produces the lesion giving rise to the paralysis, but its action on the central nervous system, that is, on the nuclei of the nerves involved, that constitutes the primary and essential lesion. The rarity with which, in both human and experimental diphtheria and in the observations of Orr and Rows, the peripheral nerves along which the toxin passes show any lesion of the axis cylinder or myelin sheath, and the constancy of central cell changes (Orr and Rows, Babonneix, Bolton) make this extremely improbable.

As Sicard [16] has pointed out with regard to so-called "ascending neuritis" we are not dealing with a neuritis at all, but with the passage of toxins along the course of the nerve. This may produce some inflammatory reaction in the lymph channels through which they pass, but not an actual neuritis. The lesion which gives rise to the symptoms is central. In this respect then the views of Babonneix and of Guillain and Laroche need modification.

We have, however, still to consider the generalized paralysis which commonly appears somewhat later than the development of these cranial nerve paralyses. Clinically, this resembles in every particular a multiple neuritis. It has these characteristics, namely, that its onset is delayed, it appears simultaneously in all the spinal peripheral nerves, and it is more chronic in its course than the earlier cranial nerve symptoms.

In the generalized paralysis following the intravenous injection of diphtheria toxin in animals (Bolton and Bown) there can be no question of a lymphogenous infection. Any involvement of the nervous system in this instance must be part of the general systemic toxæmia—an intoxication by the blood-stream.

In every case of diphtheria the toxin circulates in the blood and must reach the nervous system, central and peripheral, by this channel.

Is the generalized paralysis of diphtheria in man, then, a blood as opposed to a "lymphogenous" infection? The characteristics enumerated above are very significant in this connexion.

These points of difference might conceivably be due to a slow spread of the toxin in the cerebrospinal lymph system, but are far more probably dependent on its relative dilution as it reaches the nervous system in the blood-stream.

There seems then to be a twofold mechanism in the production of diphtheritic paralysis in man. There is the initial sometimes severe and relatively short lived "local" paralysis, due to the action of the toxin, which has ascended the nerves innervating the local lesion, on the nerve nuclei in the brain stem. Secondly there is the later, longer lasting, "generalized" paralysis, which is part of the general systemic toxæmia.

Such a mechanism would account for all the phenomena present in the ordinary paralysis of faucial diphtheria, and in that following wound infections, such as the cases recorded here.

In many wound infections, such as that recorded in Case 3, it will be manifestly very difficult to detect an initial local paralysis. Only when the infective focus is in an extremity, e.g., Case 2, can we expect to see definite "local sign" in the paralytic phenomena.

If this hypothesis of the nature and pathogenesis of diphtheritic paralysis be correct, it is not surprising that the views of different observers on the pathology of the nervous system in this toxæmia are so conflicting and inconclusive. This aspect of the subject demands re-investigation on the lines indicated in the researches of Orr and Rows.

In our present state of knowledge there is not even agreement as to whether the central or the peripheral nervous system is primarily affected.

What is true of the lesions underlying the bulbar symptoms may not be so of those manifested in the generalized paralysis. In the light of our knowledge of lymphogenous infections and guided by some definite conceptions of the pathogenesis of the condition, it should be possible to arrive at the true pathology of diphtheritic paralysis and thus to confirm the views put forward here.

In this paper the question of post-diphtheritic hemiplegia has not been mentioned. This is definitely proved to be embolic in origin and secondary to endocarditis. It does not therefore come within the limits of the subject.

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Clinical and other Notes.

NOTES ON SERUM TREATMENT OF BACILLARY DYSENTERY AND ON DYSENTERY ARTHRITIS.

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INTRODUCTORY.

For a period of a year and three months—September, 1917 to November, 1918—the writer had the opportunity of observing and treating a large number of cases of dysentery and dysentery suspects at No. 25 Stationary Hospital, Rouen. After excluding all cases of (1) amœbic dysentery; (2) acute enteritis or gastro-enteritis, generally diagnosed as “diarrhœa”; (3) various intestinal disorders (many of them the sequelæ of old dysentery) collectively termed “colitis”; there remain 973 cases which, on clinical or bacteriological grounds, or on both, were adjudged to be examples of bacillary dysentery.

In 412 of these cases dysentery bacilli were recovered from the stools. In 561 no dysentery bacilli were found, but the illness was in every instance marked by sudden acute onset, typical dysenteric symptoms and stools, and the absence, on careful examination, of *Entamœba histolytica*. The evidence as to the character of the stools is deficient in fifty of the cases from which dysentery bacilli were isolated. In forty-four no description of the dejecta during the acute stage was recorded, whilst in six it was definitely stated that the stools were not dysenteric in appearance. Some of these cases may have been therefore *apparently* simple diarrhœa. The presence of dysentery bacilli in cases of apparently simple diarrhœa is well recognized and has been recently emphasized [5] in France.

CLASSIFICATION OF CASES.

For convenience these 973 cases have been classified, according to their degree of severity, roughly in the following manner:—

(1) “Mild.” The characteristic symptoms and stools were observed in these cases (787 in number), but were not severe in degree and lasted at the most about a week.

(2) “Typical average,” or what might be termed moderately severe; dysenteric symptoms lasting on the average rather over a fortnight from the onset of the illness.

(3) “Severe,” with all the symptoms of the disease marked, but not to such a degree as to endanger life.

(4) “Grave,” all showing, in addition to severe dysenteric features, marked constitutional disturbance with toxic symptoms, such patients being on the “dangerously ill” or “seriously ill” list.

SERUM TREATMENT.

Fifty-one cases out of the above mentioned series were treated with anti-dysenteric serum. A complete record of them will be found in tabular form in Table I.

Naturally the worst cases, or what appeared to be the worst cases, were selected for serum treatment, the total of 51 so treated consisting of 7 "typical average," 22 "severe," and 22 "grave," 9 of the latter terminating fatally. Amongst cases classed as severe and grave—eighteen in number—not treated with anti-dysenteric serum, the majority had already been ill for nine or ten days when admitted, some for considerably longer. All the six grave cases, two of whom died, had already, when first seen, passed into a toxic collapsed state, a state well described in a recent account of a Shiga epidemic in France as one of dehydration and profound intoxication [1].

METHOD OF GIVING ANTI-DYSENTERIC SERUM.

Polyvalent serum was used, as supplied for the use of the Army both by Burroughs and Wellcome and by the Lister Institute.

In the earlier cases the ordinary injection into the tissues, subcutaneous or intramuscular, was practised. Later, as is shown in Table I, reliance was placed almost entirely on the intravenous method. A simple cylindrical glass vessel was used of about fifty cubic centimetres capacity, with eighteen inches of rubber tubing attached to the outlet at its lower end. The whole apparatus was sterilized by dry heat. The serum was run in by gravity in about twice its bulk of normal saline at body temperature.

The intravenous method seems to possess advantages over the ordinary injection into the tissues, since (a) it enables the serum to get to work at once; (b) the whole of the dose is available; whereas it is at least possible¹ that some of the constituents of the serum introduced into the tissues are destroyed locally; (c) it is practically painless.

Against these advantages is to be set the possible danger of anaphylaxis. Of the twenty-three patients who received serum intravenously, four had been wounded and had anti-tetanic serum some time previously during the war. Of these four "sensitized" men, one (Case 45, Table I), on receiving serum intravenously, immediately developed anaphylactic shock, and the injection had to be hurriedly discontinued. A second patient also "sensitized," had received serum by the intravenous method a few minutes before, with no ill results. Both these patients had had a subcutaneous injection of forty cubic centimetres of anti-dysenteric serum three days previously; consequently the possibility of anaphylaxis was not considered. The two other cases in question (Nos. 33 and 36) had occurred earlier in the series: they had been given twenty cubic centimetres of serum subcutaneously twenty-four hours before receiving the intravenous dose, and neither of them suffered from anaphylactic shock. A desensitizing effect therefore is not ensured in human beings by serum given *subcutaneously*. After the case of anaphylaxis above described there were no more "sensitized" patients requiring serum treatment. Consequently there was no opportunity of trying the method I had intended to adopt, namely to give quite a small quantity of serum—about one cubic centimetre—intravenously, and follow this after a few hours by the main dose, also administered intravenously in the manner already described.

¹ Cf. following paragraph *re* anaphylaxis.

THE DOSE OF SERUM.

As will be seen from Table I, there was a progressive tendency towards larger doses of serum—the greatest single dose being 120 c.c. Opinions differ as to what constitutes a large dose. Thus Cowan and Miller [2] say they “used serum fairly freely giving 40, 60 or 80 c.c. as a dose and repeated it as seemed indicated” On the other hand, Castellani and Chalmers [3] say—“the serum in our experience, should be given in large doses 20 c.c. doses twice daily and in very severe cases four times daily.”

THE TIME AT WHICH SERUM WAS GIVEN.

The statement made by Cowan and Miller [2] that “it seems probable that the value of serum is greatest in the first three or four days of the illness” is in harmony with the writer's experience, whilst the further statement “that it is of less or little value in the second week” is more or less confirmed by the results obtained in this series of fifty-one cases. The fifth to sixth days have generally seemed about the critical period for intravenous serum, at any rate in Shiga infections. One rather gained the impression that after that period a bad Shiga case was either going to get better or die, irrespective of serum treatment. This idea does not, of course, imply that serum is useless after the fifth or sixth day, since by it the *manner and rate of recovery* may be much influenced. Some of the cases recorded in Table I, especially Flexner infections, seem to provide exceptions to the general ill-success of serum treatment started in the second week—instance Case 40. In this patient it is hardly an exaggeration to say that the serum worked like a charm.

Table I gives a summary of the fifty-one cases, with the degree of illness, type of infection, dose of serum and day on which it was given, the method and the result.

TABLE I.—SUMMARY OF FIFTY-ONE CASES TREATED WITH ANTI-DYSENTERIC SERUM, IN THE ORDER IN WHICH THEY OCCURRED.

T.A. = typical average. T.N.D. = type not determined, i.e., no dysentery bacilli isolated from stools.

Case	Day	Dose	Method	Remarks
1. F. G. W., aged 21 Shiga. Fatal	10th 13th	25 c.c. 25 c.c.	Subcutem ,,	No effect. Died of exhaustion on 31st day of disease.
2. B., aged 27 Shiga. Fatal	6th 7th	50 c.c. 50 c.c.	Subcutem ,,	No effect. Died of exhaustion (complicated by sepsis and gas gangrene) on 12th day.
3. G. A., aged 32 Flexner. Grave	6th	50 c.c.	Subcutem	Gradual recovery; acute stage lasting 3 weeks. Was in bed a month and resumed ordinary diet in 5 weeks.
4. A. C., aged 26 Shiga. T.A.	10th	40 c.c.	Subcutem	Improved in 3 days; acute stage lasting 2 weeks. Convalescent 3 weeks from onset.
5. W. B., aged 38. Flexner. Severe	6th 10th	60 c.c. 50 c.c.	Subcutem ,,	Improved 3 days after second dose; stools normal 6 days after it. Good recovery.
6. O. G., aged 19 Shiga. Severe	7th	40 c.c.	Subcutem	Began to improve in 48 hours. Able to eat ordinary food 10 days later.
7. A. E. F., aged 24 T.N.D. Severe	21st	50 c.c.	Subcutem	No immediate effect. Prolonged illness. Stools still dysenteric on 34th day.

TABLE I.—continued.

Case	Day	Dose	Method	Remarks
8. J. H. F., aged 20 Shiga. Severe	4th	50 c.c.	Subcutem	Improved in 42 hours. Acute stage lasted another 2 days. Convalescent 2 weeks after onset.
9. J. M., aged 32 T.N.D. Severe	14th	50 c.c.	Subcutem	Recovery very slow. Was in bed 24 days after the 2nd dose. Apparently cured.
10. F. M., aged 30 Flexner. Severe	16th	50 c.c.	"	Improved in 3 days; free from symptoms in 6 days.
11. H. C. J., aged 32 Flexner. T.A.	16th	25 c.c.	Subcutem	Started to improve in 48 hours. Stools normal 16 days from onset of illness.
12. A. T., aged 35 Flexner. Severe	9th	25 c.c.	Subcutem	No marked effect. Acute stage ended 4 days later. Convalescent 1 month from onset.
13. W. J. H., aged 25 Flexner. Grave	11th	50 c.c.	Subcutem	No effect noticed. Started to improve 48 hours later. All acute symptoms gone in 10 days. Convalescent in 5 weeks.
14. A. B., aged 30 T.N.D. Grave	14th	50 c.c.	"	Started to improve 3 days after 2nd dose. Persistent colitis afterwards.
15. H. P., aged 20 T.N.D. Severe	12th*	50 c.c.	"	Marked improvement in 48 hours.
	1st	50 c.c.	Subcutem	Formed stools on 8th day. Good recovery.
16. T. G. S., aged 19 Flexner. Severe	5th	25 c.c.	Subcutem	Recovery gradual. Acute stage 14 days. Subsequent recovery excellent.
17. T. D., aged 22 T.N.D. Fatal	19th	50 c.c.	Intravenous	No effect. Died of exhaustion 34th day.
18. J. McC., aged 32 T.N.D. T.A.	5th	25 c.c.	Subcutem	Improved in 48 hours. Stools normal in 6 days. Good recovery.
19. S. C., aged 25 Shiga. Grave	4th	50 c.c.	Intravenous	Marked change in 24 hours. Further improvement in 24 hours. Normal stools by 28th day.
	6th	50 c.c.	"	Abdominal pain and diarrhoea less next day. Acute symptoms ceased in 5 days.
20. W. S., aged 21 T.N.D. Severe	7th	25 c.c.	Intravenous	Prior to admission. Very ill when admitted.
21. E. H., aged 30 T.N.D. Grave	5th	25 c.c.	Subcutem	Gradual recovery, lasting 1 month, but no persistent colitis.
	6th	25 c.c.	"	Effect only transitory. Very prolonged recovery with debility and myocarditis.
	9th	50 c.c.	Intravenous	General condition much better in 3 days. Normal stools 10 days after treatment.
22. W. S. S., aged 28 T.N.D. Severe	11th	25 c.c.	Subcutem	No apparent effect.
23. H. B., aged 19 Shiga. Severe	6th	40 c.c.	Intramuscular	Temporary diminution of toxic symptoms. Severe hæmorrhage. Death on 14th day.
24. H. B., aged 31 Shiga. Fatal	6th	40 c.c.	Intramuscular	Slightly better in 24 hours.
	9th	80 c.c.	Intravenous	Improved in 48 hours. Excellent recovery.
25. W. B. L., aged 24 T.N.D. Grave	8th	50 c.c.	Intravenous	No effect.
	10th	50 c.c.	"	Died of exhaustion on 16th day.
26. J. C., aged 36 Shiga. Fatal	10th	40 c.c.	Intravenous	Slight transient improvement after each dose. Died of exhaustion on 16th day.
27. A. J. C., aged 22 T.N.D. Fatal	7th	60 c.c.	Intravenous	Improvement began a week later. Recovery unsatisfactory.
28. R. T., aged 37 T.N.D. Severe	10th	80 c.c.	"	No effect.
29. S. T., aged 29 Shiga. Fatal	11th	50 c.c.	Subcutem	Toxic symptoms less for a time.
	3rd	40 c.c.	Intravenous	Died of exhaustion 31st day.
	6th	100 c.c.	"	Better in 48 hours. All acute symptoms gone in 3 days.
30. A. F. M., aged 24 T.N.D. T.A.	10th	50 c.c.	"	
	6th	40 c.c.	Subcutem	

* Exact date of onset uncertain, but at least ten days prior to serum treatment, probably much more.

TABLE I.—continued.

Case	Day	Dose	Method	Remarks
31. F. P., aged 29 T.N.D. Severe	9th	40 c.c.	Subcutem	Typical dysenteric stools for 2 more days. Colitis lasted at least 16 days
32. P. E. L., aged 47 T.N.D. Fatal	5th	100 c.c.	Intravenous	Diarrhoea and abdominal pain ceased by 12th day. Died 14th day (acute nephritis).
33. S. F. S., aged 20 Flexner. Severe	3rd 4th	20 c.c. 100 c.c.	Subcutem Intravenous	To "desensitize." Marked improvement within 24 hours. Rapid recovery.
34. G. S., aged 28 T.N.D. Severe	6th	40 c.c.	Subcutem	(Prior to admission). Dysenteric symptoms lasted 20 days. Slow recovery.
35. J. A. P., aged 25 T.N.D. Severe	6th	40 c.c.	Intramuscular	Diarrhoea less in 3 days. Dysenteric state lasted 3 weeks. Subsequent recovery satisfactory.
36. R.H.H.S., aged 23 Shiga. Grave	7th 8th	20 c.c. 60 c.c.	Subcutem Intravenous	To "desensitize." Marked improvement in 48 hours. Severe hæmorrhage 16th day. Eventually quite recovered.
37. E. H., aged 33 Shiga. Grave	6th 8th	60 c.c. 60 c.c.	Intravenous "	No marked effect from first dose. Started to improve a few hours after second. Excellent recovery.
38. E. F. H., aged 38 Shiga. Severe	9th	40 c.c.	Intravenous	No appreciable effect. Recovery slow (with arthritis of knee) after 29 days.
39. H. T., aged 34 T.N.D. T.A.	6th	40 c.c.	Subcutem	Better in 48 hours. Rapid recovery. Convalescent on 12th day.
40. J. F., aged 42 Flexner. Severe	10th	100 c.c.	Intravenous	Marked improvement in 24 hours. All symptoms gone in 16 days. Rapid recovery.
41. T. W. B., aged 28 Shiga. T.A.	3rd	40 c.c.	Intramuscular	Improved. Stools free from blood in 48 hours. Colitis lasted 2 weeks. Good recovery.
42. C. R., aged 27 Shiga. Grave	3rd	60 c.c.	Intravenous	Marked improvement in 48 hours. Practically convalescent in 2 weeks.
43. F. W. G., aged 19 Shiga. Grave	6th 8th	80 c.c. 70 c.c.	Intravenous "	Slight improvement in 48 hours. Marked improvement in 24 hours. Good recovery.
44. D. L., aged 26 Shiga. Fatal	7th 10th	40 c.c. 80 c.c.	Subcutem Intravenous	(Prior to admission.) No apparent effect. Temporary improvement. Died suddenly on 17th day of acute myocardial failure.
45. R. F., aged 22 Shiga. Grave	4th 7th	40 c.c. 70 c.c.	Subcutem Intravenous	(Prior to admission) No apparent effect. Improved in 48 hours. Practically well in 3 weeks.
46. E. W., aged 22 Shiga. T.A.	9th	40 c.c.	Subcutem	(Prior to admission.) Colitis lasted 11 days. Dysentery arthritis began on 14th day.
47. H. R., aged 20 Shiga. Severe	6th	40 c.c.	Intravenous	Started to improve in 24 hours. Stools formed in 3 days. Excellent recovery
48. C. F. C., aged 36 T.N.D. Severe	19th	60 c.c.	Subcutem	Gradual recovery. Colitis lasted 3 weeks and probably persisted.
49. C. M., aged 36 Shiga. Grave	4th 6th	80 c.c. 120 c.c.	Intravenous "	Striking change in 24 hours. Diarrhoea less in 48 hours. Colitis lasted about a month.
50. H. S. M., aged 26 T.N.D. Severe	10th	100 c.c.	Intravenous	Striking improvement in 24 hours. Diarrhoea ceased in 48 hours. Excellent recovery.
51. H., aged 20 T.N.D. Grave	6th	80 c.c.	Intravenous	Started to improve within 48 hours. Dysenteric stage about 3 weeks. Good recovery.

Tables II and III are intended to show the effect of the time at which serum was given on the nature of the subsequent recovery.

TABLE II.—FIFTY-ONE CASES TREATED WITH ANTI-DYSENTERIC SERUM.

Day injected	Number of cases	Died	Recovery unsatisfactory
1st—4th	9	1	1
1st—5th	13	2	2
6th—9th	24	4	5
10th and over ..	14	6	6

TABLE III.—TWENTY-THREE CASES THAT RECEIVED SERUM INTRAVENOUSLY.

Day injected	Number of cases	Died	Recovery unsatisfactory
1st—5th	6	2	1
6th—9th	12	2	2
1st—6th	10	2	1
7th—9th	8	2	2
10th and over ..	5	3	—

THE VALUE OF SERUM TREATMENT.

The value of anti-dysenteric serum may be considered from two aspects:—

(1) *Its power to save life.*—The writer's experience suggests that such power is available only during the first few days of the attack—perhaps five days, or even six days, if the intravenous method be used.

(2) *Its effect on the rate and completeness of recovery.*—As is well known, in the more severe cases the initial dysenteric phase is succeeded by a state of profound prostration—the stage of “dehydration and profound intoxication”—characterized by rapid heart's action, great muscular weakness, tendency to vomit or hiccough, thirst, difficulty in swallowing, and in extreme cases the typical “abdominal” facies—diarrhœa may or may not have ceased. Abdominal pain is generally absent. This stage generally makes its appearance some time about the tenth day. Once it is fully developed, no serum treatment seems of benefit. Occasionally it is already present much earlier than the tenth day (Case 2, Table I).

Between the critical period of the fifth to sixth days and the extreme toxic phase, there is an intermediate stage about the sixth to ninth day, during which anti-dysenteric serum may be given with a reasonable prospect of cutting short the attack and effecting a more complete recovery than would otherwise have followed.

To show this favourable effect of serum treatment, the following table is given. In it are contrasted forty-seven serum treated cases with 134 non-serum treated cases—fatal cases being excluded—to show the duration of the dysenteric stage and occurrence of sequelæ in the two groups.

The term “persistent colitis” is applied only to cases in which a dysenteric state continued for at least a month. Table IV shows this complication occurring twice in 51 serum treated cases as against 28 times in 134 cases not treated with serum. The two serum treated cases that suffered from arthritis both received their serum as late as the ninth day of their illness. In an analysis of cases treated with anti-dysenteric serum it was stated recently [4] that “not a single case of dysenteric arthritis occurred amongst patients who were treated on or before the fifth day of illness.”

TABLE IV.—COMPARISON BETWEEN FORTY-SEVEN CASES TREATED WITH SERUM AND 134 CASES NOT TREATED WITH SERUM.

Class of case	No. of cases	Duration of dysenteric stage	Recovery unsatisfactory	
			Persistent colitis	Other complications
Serum treated—				
T.A.	7	Average 11 days.. ..	—	1 arthritis
Severe	22	„ 20 „	1	2 { 1 arthritis 1 debility
Grave	13	„ 23 „ (2 uncertain)	1	1 debility
Not serum treated—				
T.A.	118	88 cases, average 16 days (6 uncertain)	24*	3 arthritis
Severe	12	11 cases, average 27 days (1 exceeded 2 months)	4	2 { 1 debility 1 arthritis
Grave	4	Average 24 days.. ..	—	3 debility

* Not included in the 88 in third column.

CONCLUSIONS.

(1) Anti-dysenteric serum should be given in large doses, about 60 to 100 cubic centimetres.

(2) It is best given intravenously.

(3) It is most efficacious when given early in the disease.

(4) From the point of view of serum treatment a severe case of bacillary dysentery may be considered in three stages.

(a) From the onset of the illness to a period somewhere about the fifth to sixth days. During this stage anti-dysenteric serum (especially if given intravenously), has a most favourable effect both as regards averting a fatal result and hastening recovery. A minority of cases fail to respond even to this early treatment.

(b) An intermediate stage, from about the sixth to the tenth day. A case having reached this stage is likely either to die or recover irrespective of serum treatment. Nevertheless the rate and completeness of recovery may be still affected by serum, especially if given in large doses, such as 100 cubic centimetres.

(c) A third stage—the stage of “dehydration and profound intoxication”—generally starting about the tenth day. During this phase of the disease serum treatment is practically useless. A minority of cases which have lasted to the tenth day or beyond it (without passing into the third stage) are still benefited by serum given in sufficient amount.

DYSENTERY ARTHRITIS.

In a series of 973 cases of bacillary dysentery, true dysentery arthritis occurred in eight instances. The particulars of these eight cases are afforded by the following summary in tabular form.

(1) CLINICAL FEATURES.

(a) *Character of joint Swellings.*—It will be seen from the accompanying table that the knee-joint was involved in every case, and that only two cases had other joints affected. One of these two had both temporomaxillary joints involved in

TABLE V.

Case	Infection and severity	Joints affected	Day of onset	Duration	Pyrexia	Stools at time of onset	Nature of effusion
1. A. E. W., aged 28	..	Left knee	19th	1 month at least	5 days ..	Some mucus; trace of blood	Not examined
2. H. H., aged 19	..	Right knee	About 20th	3 weeks at least	Present (duration uncertain)	Not known ..	" "
3. J. S. S., aged 31	..	Both knees; both ankles; several fingers	15th	5 weeks ..	Present (duration uncertain)	Simply loose	Serous; sterile. (Test for agglutinin not made)
4. E. F. H., aged 38	..	Right knee	24th	At least 5 days	At least 5 days	Normal	Not examined
5. C. A. D. G., aged 27	..	Left knee; both jaw joints	17th	34 days ..	2 weeks ..	" "	Serous; sterile; specific agglutinin present
6. W. P. B., aged 28	..	Both knees	19th	10 "	3 days..	Nearly all mucus	Serous; sterile; no agglutinin
7. H. E. C., aged 19	..	One knee	21st	12 "	3 ..	Simply loose	Serous; sterile; specific agglutinin present
8. E. W., aged 22	..	Left knee	14th	22 "	16 ..	Normal	Serous; sterile; specific agglutinin present. (Examined twice)

T. A. = typical average or moderately severe.

T. N. D. = type not determined, i.e., no dysentery bacilli isolated from stools.

turn, the symptoms lasting only a few days. The other is described in the table as having arthritis of both ankles. In reality the fluid swelling was chiefly on the dorsal surface of the foot and ankle (with oedema of the foot) and appeared to be in the synovial sheaths of the extensor tendons. The fingers were affected at the proximal interphalangeal joints. The knee-joint swellings were all very similar. They were recognized about two days after the onset of pain and gradually increased for a few days, until the deformity of the part was obvious—the natural hollows being obliterated, with marked swelling of the subcrureus bursa. No reddening or flush of the skin or signs of periarticular thickening were present.

(b) *Time of Onset and Course.*—The day of the disease on which arthritis began is shown in each case in the table. The commonest time was somewhere about the twentieth day, which is the day mentioned as the usual starting-point of the arthritis in Cowan and Miller's cases, recently described by them.¹ [2].

A further point shown in the table is that the arthritis outlasted the pyrexia by which it was at first accompanied.

Five of the cases were observed from start to finish, and in them all traces of fluid disappeared. No deformity of or thickening round the joint was apparent and there were no adhesions. The only abnormality was marked wasting of the muscles, the extensor muscles of the thigh and the calf muscles.

(c) *Treatment.*—The treatment consisted in immobilizing the joint by the application of a McIntyre's splint and the removal of some of the fluid to relieve the pressure—60 to 100 cubic centimetres was removed, generally much to the relief of the patient.

(d) *Nature of the Arthritis.*—It has no relation to the arthritis of serum sickness; five out of the eight cases had received no serum. Neither had it any relation to previous injury in the eight cases in question. No gonorrhœa was present in any of the cases and there was no history of such infection. Clinically it might have been mistaken for gonorrhœal arthritis. From acute rheumatism it differed in the abundant effusion with absence of periarticular inflammation, by its being generally limited to the knee-joint and by the absence of any cardiac manifestations. It seems probable then that this form of arthritis is a true complication of bacillary dysentery and merits the name "dysentery arthritis." It is clearly not confined to severe cases of the disease, but may equally well occur after mild attacks; nor does its onset coincide with any particular stage in the intestinal inflammation, as far as can be judged by the stools. Both these points are shown by Table V.

No dysentery bacilli were recovered from the joint fluid of the five cases examined. In the cases described in their paper by Cowan and Miller [2], the joint fluid was cultured in two cases, one proving sterile, the other containing only *B. coli*. These negative findings are in accordance with the commonly accepted view that the arthritis is due to toxins.

(2) LABORATORY FINDINGS.

The joint fluid was taken for examination in five out of the eight cases, in one case on two separate occasions nine days apart. All the samples were similar in

¹ "Dysentery—A Clinical Study." JOURNAL OF THE ROYAL ARMY MEDICAL CORPS (vol. xxxi, October, 1918).

character, namely a viscous, straw-coloured liquid, slightly turbid, which clotted on standing. No micro-organisms were found by direct examination of smears from the clot, or by culture.

Agglutination tests were made by Dreyer's macroscopic method with the standard types of dysentery bacilli, using both the blood serum and joint fluid. The details are given in Table VI.

In Cases 7 and 8 practically the same degree of agglutination was obtained both with the joint fluid and the blood serum. In the latter case, examined nine days later, the agglutinin content of the joint fluid had increased, whilst the blood serum remained at the same titre.

In Case 6 neither the joint fluid nor blood serum showed any agglutinins. In this patient no dysentery bacilli had been found in the stools.

In Case 5 the joint fluid was examined a few days after the blood serum and showed a higher agglutination than the latter with *B. dysenteriae* Flexner.

The examinations of joint fluid and blood serum, both bacteriological and serological, were made in the laboratory of No. 25 Stationary Hospital, by Captain P. Hartley, R.A.M.C.(T.), to whom the writer's thanks are due.

TABLE VI.

Case No.	Agglutination results					
	Blood serum			Joint fluid		
3	18.8.18	36 units (Shiga)	.. ..	22.8.18	Agglutinins not determined	
5	22.9.18	18 ,, (Flexner)	.. ..	24.9.18	More than 50 units (Flexner)	
7	10.10.18	More than 50 units (Shiga)	..	10.10.18	More than 50	,, (Shiga)
8	23.10.18	48 units (Shiga)	23.10.18	24 units (Shiga)	
	1.11.18	50 ,, ,,	1.11.18	50	,, ,,

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- [5] Major A. W. W. ELLIS, C.A.M.G. Personal communication as yet unpublished.

CASE OF A FRAGMENT OF SHELL IN THE ARTERIAL CIRCULATION.

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THE following interesting case is put on record owing to the great rarity of the condition and its great interest from a radiological point of view. Cases of foreign bodies in the circulation have been described by French observers, but as far as the author knows this condition has not been described before, confirmed by autopsy, in English literature.

Serjt. P. was wounded at 7 p.m. on August 7, 1917, and was admitted to a

casualty clearing station on the morning of the 8th, in a very collapsed condition, with a running pulse of 128 per minute, with wounds in the left posterior axillary line, fifth interspace, left lumbar region and left thigh. On admission the patient was too ill for a thorough clinical examination of the chest, but it was found that the heart was not displaced and that there was well-marked pericardial friction.

On the 10th the patient was moved to the X-ray room and screened. It was then found that the shadow over the left chest was uniformly obscure and dense, that there was practically no movement seen in the left diaphragm, which was depressed and flattened to an obtuse angle. The right chest and diaphragm were normal in appearance. The most striking picture was seen in the cardiac region. The shadow of the heart was much to the right of the mid line, which would be expected with a large hæmothorax which gives the picture of a combination of great obscurity of the chest, depression and fixation of the diaphragm on the affected side, with dislocation of the heart shadow to the unaffected side. However, in this instance, not only was the heart shadow more to the right than normal, but it was increased in breadth, and was globular in shape. The cardio-hepatic angle was obtuse and the muscle of the right side of the heart could be differentiated from the extreme edge of the heart shadow, and the diagnosis of pericardial effusion was made. About 1 inch above the base of the heart and 2 inches from the right border and $2\frac{1}{2}$ inches deep, a foreign body was made out within the heart shadow with an extraordinary movement. The black shadow of the foreign body, some two centimetres long, with a maximum breadth of 0.6 centimetre, could not be separated from the heart shadow whatever the incidence of the X-rays. The movements seen were a downward movement with the mediastinal respiratory movement, a lateral movement with systole to the right, and a flail-like movement, with the base of the flail to the right side. These movements were synchronous with the heart beats, giving a curious rotary effect. The diagnosis was then made that the foreign body was within a chamber of the heart, probably within the left ventricle, and had one end of it fixed under a valve flap. Half an hour after returning to the ward from this examination, patient called attention to his left leg, which was found to be blue in colour and cold from above the knee to the foot. One hour later the leg appeared to be normal again. On the 11th the wounds in the left lumbar region and left thigh demanded urgent surgical interference owing to the development of signs of gas gangrene, and on his way to the operating theatre, patient was again screened with a view to more accurate localization of the fragments of the thigh and lumbar region. His chest was also screened, and although otherwise the picture was identical, no trace of the foreign body in the heart could be seen, and on rapid examination of the course of his thoracic and abdominal aorta it was found that the missile must have passed through the aortic valve and was lying in the abdominal cavity $2\frac{1}{2}$ inches deep from the anterior abdominal wall, 1 inch below and 1 inch to the left of the umbilicus. No movement was seen, and the foreign body was apparently within the aorta at its bifurcation. On the morning of August 12, the patient's condition did not seem the worse for the operations on his thigh and loin under gas and oxygen, and the aspiration of six ounces of blood from the left pleural cavity. Pericardial friction was well marked, no increase of cardiac dullness could be made out, there was resonance in the left

axilla, and the breath sounds were generally harsh on the left side. He died at 6.25 p.m. this day.

Autopsy.—Surgical emphysema of face, neck and thorax. Left chest contains small amount of blood. Entrance wound in left posterior axillary line. Pericardium contains small amount of blood and small tear on the posterior inferior aspect. There was an exudate of fibrin over the anterior and left lateral walls.

Heart.—A small hole, surrounded by hæmorrhage into the myocardium, on the posterior wall of the left ventricle. The interior of the left ventricle was clear except that there was a ragged tear on the septal wall, and the cordæ tendinæ of the aortic valve were also torn. The heart muscle was very pale and full of gas.

The liver and spleen were very congested and full of gas. In the left lung there was a small hæmorrhagic infarct with fragments of indriven rib; the right lung was normal.

The foreign body was found at the bifurcation of the left common iliac artery surrounded by dark red clot, the intima was apparently undamaged. There was no tear of the intima at the aortic bifurcation.

Since the second time of screening on the 11th, the missile must have moved down the left common iliac artery and became lodged at the bifurcation. At the time of the second screening there was no difference noted in the femoral pulses, but the missile most probably moved down the aorta, passing through the aortic valve, within half an hour of the first screening, when the phenomena in the left leg were noted. The patient died of general gas gangrene after having lived five days with a piece of shell free in his arterial circulation.

A METHOD OF INCREASING THE YIELD OF MENINGOCOCCUS AGGLUTINATING SERUM FROM THE RABBIT.

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AND

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In October last it became evident that the necessary supply of rabbits for the production of diagnostic meningococcal serum was going to be difficult to keep up, more especially in view of the increasing demand for these products.

Up to that date the method elaborated by Major T. G. M. Hine was followed and no change has been made in the method of the preliminary injections.

Under the system then in vogue, 2.5 cubic centimetres of serum was produced per 100 grammes rabbit weight.

The death-rate of rabbits is high, partly on account of the toxicity of the organism, partly from the necessity of using only young animals (from 1,000 to 1,400 grammes), these alone producing a satisfactory quantity of agglutinins.

As up to nearly half a litre of serum is issued per month, it was felt to

be imperative that the quantity yielded per rabbit should be increased if the demands were to be met.

Various methods were tried, but none gave satisfactory results, the most promising being the injection of peptone into the peritoneal cavity a few hours before killing. The resulting exudate of serum contained agglutinins in fair amount, but unfortunately the titre of the blood serum was lowered correspondingly; a case of robbing Peter to pay Paul.

The following method of intermittent bleeding was finally devised. Intermittent bleeding with large animals is a commonplace and for the method to be justified with an animal the size of a rabbit the gain in serum obtained must be considerable and the time taken inconsiderable. The writers claim to have achieved these results.

The following is the new procedure: On the eighth or ninth day after the first injection, when the rabbit shows a titre of 1 in 400 the rabbit is bled, twenty cubic centimetres being taken from the ear. This yields about fourteen cubic centimetres of serum. This operation is repeated next day and the animal killed the following day. The titre for agglutinins tends to rise, though the rise is but slight in this case and not invariable, the highest titre of a series being generally at the second bleeding. The blood when the animal is killed is often milky in appearance, but this does not interfere with its agglutinating properties.

By the above method the serum yielded per rabbit is doubled; but if it is desired to obtain more after the second bleeding an injection of dead cocci is given. This dose must be very much smaller than that injected before or the animal will probably die. After five to ten days interval the animal may then be subjected to a further series of bleedings.

This method tends in the case of the meningococcus, but by no means invariably, to introduce group agglutinins and must be used with care.

A further advantage of the method is that that most annoying of accidents does not happen, i.e., killing an animal when its agglutinating curve is on a downward grade, and finding oneself left with a sample of serum of 1 in 200 instead of 1 in 400 titre. The writers invariably test each sample of blood immediately it is drawn, so that they know early the next day whether to proceed or to stop and give further injections.

The technique is as follows and should be followed accurately, otherwise the operator will find himself taking half an hour to extract ten cubic centimetres of blood: Shave the outer side of the ear on the hairy or lower edge, i.e., the margin not generally used for injections. A large vein is thus laid bare which puncture proximally to the entrance of a branch vein with a splinter of glass obtained from a broken microscope slide; this splinter should, if possible, have a spicule which fixes the vein and prevents it rolling to one side. Then warm the ear by holding it near a carbon filament lamp. In this way a test tube can be filled in five minutes. We have obtained ninety cubic centimetres of blood from five animals in twenty-six minutes and this example is merely quoted to show the time taken by this method.

Give the rabbit a warm bran mash after bleeding and keep it for a couple of hours in a box heated with an incandescent carbon lamp and bed down with plenty of straw. Treated like this a rabbit remains lively and does not even lose

weight. The following figures are remarkable but illustrate the point. The titre of this serum was high and never varied, i.e., 1 in 800.

Date :	Jan. 19	Jan. 20	Jan. 21	Jan. 22	Jan. 23
Weight in grammes	1,550	1,580	1,600	1,610	1,600
Amount of blood taken ..	15 c.c.	12 c.c.	12 c.c.	21 c.c.	14 c.c.

rabbit still lives.

We have ventured to publish this method which is both rapid and effective as the scarcity of animals renders the productivity of serum of real importance. In any serum in which the question of group agglutinin is not of paramount consideration, quantities much in excess of those mentioned may be obtained. With us a 1,500 gramme rabbit gave 125 cubic centimetres of highly specific serum of a titre of 1 in 200 and this could probably be exceeded. We may state that although we supply large quantities of normal serum per month no animal has been killed in the laboratory in the last ten weeks for this purpose, it having been procured by this method of bleeding.

NOTES ON THE SYMPTOMATOLOGY AND MORBID ANATOMY OF SO-CALLED "SPANISH INFLUENZA," WITH SPECIAL REFER- ENCE TO ITS DIAGNOSIS FROM OTHER FORMS OF "P.U.O."

BY CAPTAIN E. RIVAS HUNT.

Royal Army Medical Corps.

THE recent outbreak of a number of cases of what appears to be a new form of so-called "influenza" has greatly added to the number of cases admitted to the base hospitals with the provisional diagnosis of "P.U.O." and some months' experience in the medical wards of a large base hospital in France has suggested to me that it would be useful to attempt to classify the chief diagnostic feature of some of the principal conditions which are admitted to hospital with this diagnosis.

The term "P.U.O." although useful, and in some cases necessary, is at the same time too loose, and too much lacking in scientific exactness, to be wholly satisfactory. Moreover a more exact diagnosis is desirable, both from the point of view of prophylaxis, and if necessary isolation, and also for the purpose of prognosis as to the probable duration of the patient's unfitness for military service.

Certain of the conditions liable to be included under this heading have but to be remembered to be excluded in the majority of cases, by appropriate clinical or bacteriological examination. Among these may be mentioned: (1) Malaria; (2) *Bacillus coli* infections, particularly *coli bacilluria*; (3) malignant endocarditis. But a smaller group remains, comprising (4) the trench fevers; (5) the enteric group, including typhoid and paratyphoid fevers, which for my purpose may be considered together; and (6) the influenzal group, including true influenza and the recent epidemic, which in the present condition of uncertainty as to its bacteriological causation, may be provisionally termed "Spanish" influenza; and (7) certain aberrant cases of cerebrospinal meningitis.

The symptomatology of "Spanish" influenza is characteristic and in view of the extreme prevalence of this disease at present, it will be useful to first consider

in some detail the principal features of this complaint as seen in France, considering *en passant* the various points which serve to distinguish it from other diseases closely resembling it.

The incubation period appears to be short, about three to four days. The mode of onset is characteristically sudden. A patient may be at work in his usual health in the morning and in the evening he may be in hospital with a temperature of 102° to 104° F. and presenting the appearance of acute illness. The earliest symptoms are usually shivering, pains in the limbs and back and very severe headache, generally but not invariably frontal in situation, sore throat, and in almost all cases an irritating severe cough is also complained of.

The appearance in most cases is quite characteristic. The patient lies curled up in bed in a drowsy condition, with flushed face and injected conjunctiva, but there is little coryza, and physical signs in the early stages at any rate, are remarkable by their absence. The facies apart from the absence of coryza, remarkably resembles that of a measles patient a day or so before the appearance of the rash.

Although severe sore throat may be complained of, little can be seen in the throat beyond some general injection of the fauces, although in some cases œdema of the uvula, or slight degree of tonsillitis is present.

Severe and irritating dry cough is usually present, but there may be no discoverable physical signs in the lungs at first. On the other hand some coarse rhonchi may be heard over the larger bronchial tubes, or a few crepitations may be heard at one or both bases.

In other cases there is an early generalized bronchitis, and in some few instances, a dry pleurisy, particularly in the left axilla, may make its appearance almost at the onset.

A small percentage of patients develop serious pulmonary complications, and the pneumonia arising in these cases presents several distinctive features. It is of a mixed lobar and broncho-pneumonic type. Several large patches of consolidation may be found, but not as a rule at the extreme base of the lung. Favourite situations appear to be in the axilla, or in the middle third of the lower lobe. A remarkable feature is the not infrequent presence of well-marked ægophony without other signs of fluid, over the consolidated area. The very loud tubular breathing and crepitations together with the increased vocal resonance, and the presence of the signs of more normal lung tissue below the patch, suggest that this ægophony is due to a very thin layer of purulent exudation over the pneumonic patch, shut off by pleural adhesions, and thus prevented from gravitating to the lower part of the pleural sac. This is confirmed by the post-mortem findings.

In some of these influenzal pneumonias the toxæmia is severe and death rapidly ensues from acute heart failure. These cases frequently present an appearance very similar to that of a patient suffering from purulent bronchitis. The colour is a curious bluish tint, suggesting at first sight that he is suffering from extreme right heart failure, but physical examination of the heart and pulse do not confirm this, and the condition appears to be due to extreme toxæmia rather than to any mechanical embarrassment of the right heart.

In other cases not quite so acute, œdema of the lungs supervenes, large quantities of semipurulent sputa are expectorated, but the patient dies from heart failure secondary to asphyxia.

The heart conditions of a very large proportion of these cases of Spanish influenza is interesting. Without any marked alteration in the size of the heart as discovered by physical examination, and with the apex beat little if at all displaced, there is a well-marked reduplication of the first sound at the apex or of the pulmonary second sound, which is also frequently accentuated; not infrequently both sounds are reduplicated. In many cases this probably indicates the presence of some degree of myocarditis. It is noteworthy that in a large proportion of cases examined post mortem here, myocarditis was found, and more or less dilatation of the heart was constant. In cases in which a murmur develops and becomes increasingly musical with displacement of the apex beat, the question of an early ulcerative endocarditis must be considered, and a blood culture and leucocyte count should be made with a view of excluding this condition.

In at least four instances I have seen a scarlatiniform rash so closely resembling the rash of scarlet fever that very careful examination was required to decide that we were not dealing with a case of the latter disease. The rash, however, was more markedly patchy in distribution, evanescent and recurrent, in some cases irritating, and the appearance of the patient's face and throat, together with the absence of the rapid pulse and strawberry tongue of scarlet fever, and also the comparatively low temperature at the time of appearance of the rash enabled us to exclude the existence of this disease.

One patient, however, who gave a history of another man in his hut having had a rash, was transferred to an isolation hospital, but at a post-mortem examination made after his death from broncho-pneumonia a few days later, the appearances presented were precisely those found in other cases of deaths from this influenzal form of pneumonia.

The tongue of these influenzal cases is almost invariably dirty and furred, and in some cases there is an offensive almost pathognomonic odour of the breath.

The onset of pyrexia is very sudden, the temperature rapidly rising to 103° F. or higher. The duration of pyrexia is generally short, and under appropriate treatment and rest in bed the temperature rapidly falls about the third to fifth day to normal, thereafter probably rising to about 99° F. on the following evening, a week from the date of onset, remaining below normal. If the pyrexia persists after the first week, it is probable that either some pulmonary complication is present, or that the diagnosis of influenza must be reconsidered, special attention being given to the possibility of the case being one of the enteric group.

The pains of this type of influenza are very characteristic, they are referred almost invariably to the muscles and soft tissues, and to a less extent to the joints rather than to the bones themselves.

The most common sites of pain are in the muscles of the thighs and calves, the lumbar muscles and muscles of the back of the neck, and to a less extent the knees and ankle-joints. The headache of influenza has already been referred to. In a very large proportion of cases it is frontal, in some cases occipital, and in a few referred to the vertex. The headache is in some cases very persistent, continuing for some days after the patient's temperature has fallen to normal, and is almost invariably extremely severe at first. The pains differ considerably from those of trench fever. In the latter the pains are most frequently referred

to the bones themselves, particularly to the inner and outer edge of the tibiae, and the bones are often very tender to palpation. The acute nocturnal exacerbations of the pains are more marked in trench fever than in influenza.

The pains of the abdominal group of influenza cases may arouse the suspicion of appendicitis. They are however more general, although frequently referred to the lower part of the abdomen. There is, however, little or no muscular rigidity and the tenderness to deep palpation is not more marked in the right iliac region than in the left. The pain does not tend to become localized and the fever and pulse-rate do not indicate progressive lesion.

There is a group of cases admitted with occipital headache and pain in the neck, closely resembling cases of cerebrospinal meningitis, but as a rule the rigidity of the neck is much less marked. In some of these cases the diagnosis is rendered more puzzling by the presence of what I may describe as a "spurious" Kernig's sign, i.e., it is impossible to say that Kernig's sign is absent, although it is more of the nature of a "clasp knife rigidity" than a true Kernig's sign. Lumbar puncture may however be necessary to exclude cerebrospinal meningitis, when although the fluid may escape under high pressure, it is clear, and does not present the characteristic cytological features of the latter disease.

TABLE I.

Disease	Mode of onset	Fever	Pains: characteristics of	Bacteriological examination	Blood count
Malaria	Sudden	Intermittent as a rule	..	Parasites in blood	..
Coli bacilluria	Gradual	Prolonged and irregular	Renal, vesical or ureteric tenderness	<i>B. coli</i> in urine	..
Malignant endocarditis	Gradual or sudden	Constant, prolonged and irregular	..	Blood culture may be positive	High leucocytosis
Trench fevers	Sudden	Frequent relapses	Pains in bones, especially shins, worse at night, shins tender	..	Moderate leucocytosis
Spanish influenza ..	Very sudden	Short, rarely relapses, subsides by crisis	Pain in head, usually frontal and back; pains in legs, usually muscular: in calves and thighs, continuous all day	..	Moderate leucopenia
Influenza	Very sudden	Short, subsides by crisis: less acute	Pain, especially in head and back	Influenza bacilli in sputum	Leucopenia
Enteric group	Gradual	Prolonged; gradual onset subsides by lysis	Vague; general	Widal's reaction	Leucopenia
Cerebrospinal fever ..	Sudden	High and irregular	Headache, usually occipital	Cerebrospinal fluid cloudy, &c.	Leucocytosis

A blood count is of great value in helping to discriminate between the various causes of P.U.O. The trench fevers are usually accompanied by a moderate leucocytosis. Malignant endocarditis, scarlet fever, and cerebrospinal fever as a rule show a marked leucocytosis. The enteric group is more usually characterized by a leucopenia. In "Spanish influenza" the leucocyte count usually varies between 5,000 and 9,000 per centimetre.

Very few cases of influenza show a true relapse, and the occurrence of a pyrexia relapsing within a few days in a supposed case of influenza suggests the probability of the case being one of trench fever.

I regret that the few cases in which the urine has been examined prevent me from making any observation on this point. I have not touched on the bacteriology of these cases, for at present this aspect of the disease is *sub judice*.

Tables I is a summary of the principal diagnostic points of the commoner causes of P.U.O. Table II gives an analysis of the post-mortem findings in thirty cases diagnosed as "influenza" at a hospital base in France during June and July, 1918. For these tables, and for other valuable suggestions, I am much indebted to Captain T. W. G. Shore, R.A.M.C., Pathologist to ——— Administrative District, France.

TABLE II.—SUMMARY OF POST-MORTEM FINDINGS IN THIRTY CASES DIAGNOSED "INFLUENZA."
MORE OR LESS DILATATION OF HEART CONSTANT.

Myocarditis	..	..	..	In 20 out of 30	
Endocarditis of mitral valve	..	..	2	30	
Pleurisy	..	..	26	30	
Pleural effusion	..	..	8	30	.. (Generally purulent).
Broncho-pneumonia	..	..	27	30	} Broncho-pneumonia the rule. Often confluent, less so in later cases.
Lobar pneumonia	..	..	1	30	
Confluent broncho-pneumonia	..	..	11	30	
Miliary pneumonia	..	..	4	30	.. Miliary or shotty broncho-pneumonia in later cases.
Pus in bronchioles	..	..	12	30	.. Resembling purulent bronchitis cases. Commoner in later cases.
Collapse when present along vertebral border of lung. Emphysema common anteriorly.					
Nephritis { Acute in 7 | Kidney as a rule pale—"toxic."					
{ Chronic in 2 } Suppression of urine in one case.					
Jaundice in 2.					
Spleen generally enlarged.					
Pulmonary glands always enlarged.					
Liver generally shows some fat.					
Pulmonary abscess in 3.					
Abscess in brain in 1.					
Old tubercle in 7.. (Much higher than average in B.E.F.)					

Reviews.

PRACTICAL NOTES ON COURTS OF INQUIRY, COMMITTEES AND BOARDS. By W. F. Cox. Printed and published by Gale and Polden, Ltd., 2, Amen Corner, London, E.C.4. Pp. 138. Price 4s. net.

The author of this book is a solicitor of many years' standing and he has written upon a subject which is not well understood by many officers in the Army particularly those in the junior ranks.

He has applied his legal knowledge to that gained in military service and produced a work which should be carefully studied by all who, in the course of duty, are ordered to take part in, or deal with the Proceedings of Courts of Inquiry, Committees or Boards.

AIDS TO SURGERY. By Joseph Cunning. London: Baillière, Tindall and Cox, 1919. Pp. viii and 420.

The fact that a fourth edition has been issued is sufficient evidence that students freely use synopses of surgery and find them helpful. It is on this ground that the author rightly meets the gentle critic who failed "to see why this book has been written." We have always thought Mr. Cunning's epitome one of the best of many, and its value in the present edition has been enhanced by a careful revision and the bringing up to date of such matters as the treatment of syphilis and tetanus, of gunshot wounds and fractures, and other advances in surgery. The author's main difficulty was to choose what to omit, and in the main he has chosen wisely and compressed a vast amount of useful knowledge into a small space.

ELEMENTS OF SURGICAL DIAGNOSIS. By Sir Alfred Pearce Gould and E. P. Gould. London: Cassell and Co., Ltd., 1919. Pp. xiv and 722. Price 12s. 6d. net.

This is a new edition of an old friend, brought up to date with revision and additions and the substitution of more radiograms in place of figures in the text, but without that tendency to plethora to which new editions and mankind are so subject with advancing years. The reviewer remembers as a student his satisfaction at getting hold of an author who could bring to a focus and make fascinating reading of the details of one of the most difficult parts of surgery, and who moreover had just that touch of dogmatism which is such a help to one struggling with the beginnings of a subject. It is with a reminiscent interest that one reads the chapters on Pulsating Swellings, on Abdominal Diseases, and on Inguino-scrotal Swellings. The reduced photographs of X-ray plates are admirably reproduced and admirably indicative of the various conditions illustrated. And while we find a good many changes in the text, we find also that the authors have omitted with discretion and added with advantage. We give a hearty welcome to the Fifth Edition.

TECHNIC OF THE CARREL METHOD. By J. Dumas and Anne Carrel. Translated by Adrian V. S. Lambert, M.D. London: W. Heinemann, 1918. Pp. 90. Price 6s. net.

This is a description of the details of the application of the Carrel method of treating infected wounds.

As pointed out in the preface, it was written primarily for the information of nurses, and it fulfils this purpose admirably. As Dr. Carrel insists, the success of the method depends on an absolutely strict adherence to all the details which he

has laid down, and he attributes the failure to obtain results as favourable as his own in the hands of other workers to omission of some of these details.

It is quite true that one seldom sees the method carried out in its entirety, and few seem to realize that the aim of the method is to produce a wound which in the shortest possible time will be fit for safe secondary suture.

If the details laid down in this little book are carefully followed the complete method will have been attained.

It is well and clearly written and the illustrations of the apparatus are excellent.

To read it without any previous information on Carrel's work would prove unconvincing, but with this previous knowledge it is interesting and instructive.

We note that Plate II has been unnecessarily inserted twice.

J. W. W.

THE URETHROSCOPE IN THE DIAGNOSIS AND TREATMENT OF URETHRITIS. By Major N. P. L. Lumb, O.B.E., R.A.M.C.(T.C.). London: John Bale, Sons and Danielsson, Ltd., 1919. Pp. xii and 51. Price 10s. 6d.

THIS little book should form an excellent guide to those taking up the use of the urethroscope for the first time. It is well and clearly written, and the plates with which it is illustrated are excellently reproduced and have the great merit of having been drawn from actual cases.

The author strongly recommends the Windham-Powell Urethroscope, which permits of air distention, for all examinations of the anterior urethra, and Buerger's latest model of cysto-urethroscope for examinations of the posterior urethra.

Chapters II and III give a very good description of the appearances of the normal urethra and its associated glands, and the beautiful reproductions of the urethroscopic appearances make the text particularly clear.

Chapters IV and V are devoted to the pathological appearances produced by an attack of gonorrhœa, and should be of the greatest assistance, especially in clearing up the cause of protracted attacks which obstinately resist treatment, and in controlling by direct observations the result of treatment.

Chapter VI gives the indications for urethroscopic examination in cases of urethritis.

The whole subject is put briefly and clearly and there is an entire absence of padding.

We hope that the author will carry out the intention expressed in the preface, of producing later a more extended work on the same lines.

J. W. W.

Journal
of the
Royal Army Medical Corps.

Original Communications.

FILARIAL INFECTION IN MACEDONIA.

REPORT OF TWO CASES OF *FILARIA CONJUNCTIVÆ* (ADDARIO) IN MAN
WITH THE FIRST RECORDED DISCOVERY OF THE MALE WORM.

BY CAPTAIN J. GRAHAM FORBES.

Royal Army Medical Corps.

Formerly Pathologist to the — General Hospital, British Salonika Force.

SEARCH into the literature on the subject of filariasis yields evidence of the extreme rarity of infection by *Filariasis conjunctivæ*—a condition confined in its geographical distribution to the south-east of Europe, known to occur in horses and asses, its normal hosts, and incidentally, but seldom, developing in man.

Records of six examples of human infection exist, and in every case the solitary female worm, usually immature, only has been found.

The first of the two cases to be described provides the only occasion hitherto recorded of the discovery of the male type of *Filaria conjunctivæ*. Although this parasite, first so named in 1885 by Addario, was obtained from the eye, it is not necessarily restricted to that region; for it has been described in 1906 by Alessandrini, as occurring in the forearm in a case very similar to that recorded here.

The two patients, one of whom, a private in the Royal Army Medical Corps, with eighteen months' service in Macedonia, had not previously been out of England, the other a Serbian, came under treatment at the same General Hospital attached to the Royal Serbian Army, the former in February, the latter in June, 1918.

Case 1.—Pte. J. B. (R.A.M.C.), one morning, early in December, 1917, noticed irritation, redness and slight swelling on the outer side of the upper

part of his left forearm, and, in the skin over it, two small puncture marks, which suggested to him the bite of an insect. During the day this became a definite lump about the size of a filbert nut. As the lump was quite painless, he gave it little further attention at the time, although it showed no signs of disappearing. Two weeks later the whole of the upper part of the forearm became swollen, hot and red, but still free from pain. It remained so for three days, and then subsided, leaving the original nodule as before. This swelling up of the forearm recurred at intervals of about ten to fourteen days, was never painful, and lasted about three days, but did not interfere with his duties as batman.

At the fourth recurrence he applied for treatment. It was decided to wait until the swelling had subsided, and a fortnight later early in February, he was admitted to hospital under Captain Lees, M.C., for operation. On incision through the skin of the upper part of the forearm, a small tumour was found firmly embedded in the subcutaneous tissue overlying the head of the radius and the sheath of the supinator longus muscle, so that it could only be removed by dissecting out from the surrounding tissues. The tumour resembled a lymphatic gland measuring 1 by $\frac{2}{3}$ by $\frac{1}{2}$ inch. On incision into the substance of the nodule a thread-like worm suddenly protruded for a distance of $\frac{3}{4}$ inch. The specimen of both tumour and worm was then sent to the laboratory for detailed investigation. Two days after the removal of the nodule, the epitrochlear gland from the same arm was excised for microscopical examination. The subsequent course of the case was uneventful. The operation wounds healed by primary intention, and the patient has remained well ever since.

PATHOLOGICAL REPORT.

Gentle traction on the end of the worm protruding from the tumour resulted in its complete removal, but in three portions, the original incision into the excised nodule having divided its length in two places.

To the naked eye the worm was semi-transparent, white in colour, and showed faint but definite transverse marking. When placed in saline it exhibited slight waving movements for a short time. From the severed ends of the cut portions there poured a copious stream, which created a visible cloudiness of the saline; some of this was collected and in stained preparations showed the presence of a number of a very small round cells, three to four microns in diameter, displaying internally a faint cruciform structure, thus ⊕—in all probability spermatozoa, which in nematodes, Dr. Leiper informs me, are aflagellate.

After preliminary examination in saline, the worm was dehydrated in solution containing seventy per cent alcohol and five per cent glycerine, and subsequently mounted in glycerine jelly.

Measurements.—Length 58 millimetres (fig. 1). Greatest breadth (towards the head), 0.46 millimetre (at a distance of 2 millimetres from the

end). Average breadth, 0·35 millimetre. Breadth of head, 0·2 millimetre (at a distance of 0·1 millimetre from the end). Breadth of tail (at the bend) 0·25 millimetre, (at the extreme tip) 0·1 millimetre.



FIG. 1.—Actual size, length 58 mm.



FIG. 2.—Head.

MICROSCOPICAL EXAMINATION.

(1) *The Male Filaria*.—Under the low power by transmitted light the substance of the worm appears of a brownish colour, invested by a transparent cuticle about 8 microns in thickness and composed of an inner and an outer layer. Throughout the greater part of the length of the worm the cuticle shows fine transverse striation about 1 to 2 microns apart, but not apparent in the portion enveloping the head and the extreme tip of the tail.

Beneath the cuticle and running in the long axis can also be seen the longitudinal striation of the dorsal and ventral musculature, by contraction of which the envelope is thrown into shallow transverse folds giving the faintly corrugated appearance visible as already mentioned, to the naked eye at the original examination.

The anterior extremity (fig. 2) tapers from a width of 0·4 to 0·2 millimetre, and is blunt-pointed without obvious papillæ protecting the minute central oral aperture. At this point the cuticle is invaginated to communicate with the fine cuticular lining of the pharynx and its prolongation into the œsophagus.

At a distance of 0·4 millimetre from the orifice the alimentary tube is deflected laterally in a sharp angular bend to the right followed by a broad loop to the left, and is then continued on in a fairly straight course, but at various points it is possible to make out the fine coils of either the mid

and hind gut, or the genital tubules. On either side of the anterior end of the tube are seen small groups of tissue, possibly frame work supporting the nerve structures encircling the oesophagus. The caudal end (fig. 3) is curved at a blunt angle towards the cloacal aperture at a distance of under 0·1 millimetre from the tip and projecting from the aperture is seen a delicate filamentous spicule, part of the copulatory organ, 0·25 millimetre in length. No papillæ whatever are to be made out on the tail.

The Tumour and Gland.—The nodule from which the worm had been removed was examined in the fresh state but failed to show the presence of a second or female worm or evidence of microfilariae in the wall of the cystic interior.

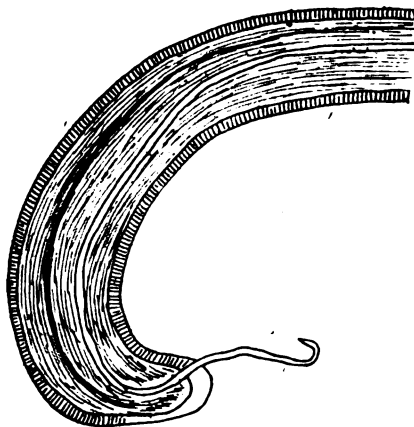


FIG. 3.—Tail.

Filaria conjunctiva ♂ (Addario). Pte. J. B.—Obj. 16 mm. E. P. × 10.

Sections show the nodule to be composed of fibrous connective tissue and round cell infiltration, traversed by collapsed spaces lined with what are possibly the remains of a flattened endothelium.

These spaces may represent original lymph channels blocked by the lodgment of the filaria and subsequently shut off and enclosed by the resulting zone of inflammatory reaction and fibrous connective tissue formation (fig. 4).

No filaria or microfilariae could be seen in the sections.

The excised epitrochlear gland revealed nothing abnormal either in smears from the fresh tissues or in stained sections.

Examinations of the patients' blood were made on several occasions both by day and night in fresh and stained films but failed to show the presence of any microfilariae and gave no evidence of leucocytosis.

A differential leucocyte count taken on the day after the operation was as follows :—

Polymorphs	47	} Per cent
Large mononuclears ..	..	..	..	2
Small lymphocytes ..	..	..	..	38
Large lymphocytes ..	..	..	..	8.5
Eosinophils ..	..	..	..	3.5
Basophils	1	

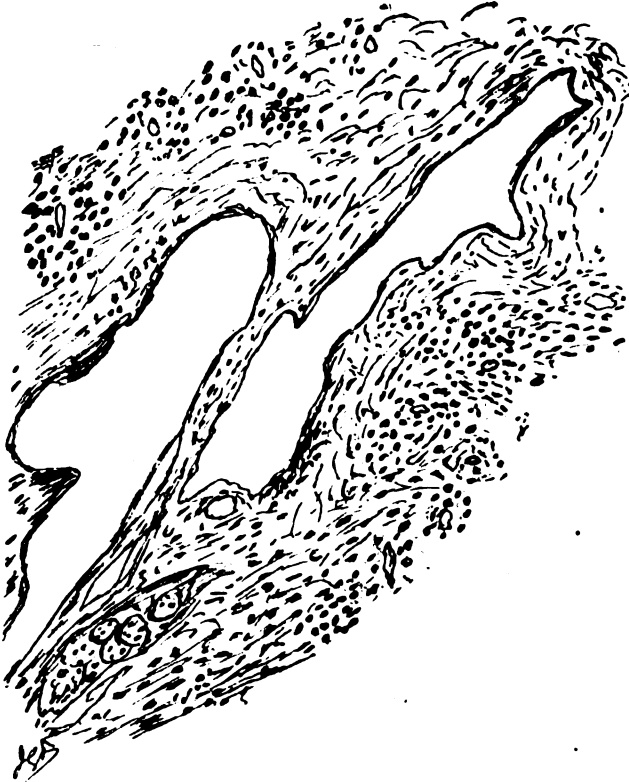


FIG. 4.—Section of filarial tumour of *F. conjunctivæ* from left forearm of Pte. J. B., showing cystic spaces, fibrous tissue, and small cell infiltration.

Case 2.—Pte. Petar Mitrovitch—a Serb—was admitted to hospital on June 27, 1918, under the care of Captain MacDougall, R.A.M.C., suffering from a swelling of the right side of the nose.

History.—For the past year he had been stationed with Serbian troops in a Turkish village on a part of the Macedonian front. Two months previous to his admission in hospital, the right side of the face suddenly became swollen. He described the swelling as white and painless, with burning and itching sensation over the side of the nose. The condition of the face subsided somewhat as the result of local applications but the swelling on the side of the nose persisted.

On Admission.—On the right side of the nose and just below the right

lacrimal sac was a small, movable tense cystic swelling not involving or adherent to the skin.

Operation was performed by Major Mills, R.A.M.C., three days after admission. Incision was made over the swelling and a small cyst was exposed and dissected out. Its wall was thick and adherent to the underlying tissues; when cut into a small quantity of opaque glairy fluid exuded from the definite cavity occupying the interior of the cyst, together with a delicate filiform worm, which was extracted and has been found to measure about $3\frac{3}{4}$ inches (ninety-four millimetres).

The skin incision was closed with horsehair sutures and a firm pad and bandage applied. A week later (July 7) the stitches were removed.

On July 9 a small hard movable swelling probably an inflamed gland was noticed on the left side under the lower jaw.

On July 24 there was a recurrence of the cystic swelling at the side of the operation wound—there was also a slight enlargement of the glands on each side just below the symphysis of the lower jaw.

Blood film examinations made on two separate occasions failed to show the presence of any microfilariae.

I have at present no further clinical particulars of this case and it is thanks to the kindness of Captain Lees, M.C., R.A.M.C., who sent me the notes and the specimens of the cyst and filaria that I am able to place them on record.

I subsequently sent the notes and specimens of the two cases above described to Dr. R. F. Leiper who has very kindly identified them both as belonging to the same species; in the one case the mature male, the first hitherto recorded, and in the second case, the immature female of *F. conjunctivæ* of Addario.

The female specimen is incomplete and unfortunately the head is missing; what remains measures ninety-four millimetres, but the character of the finely striated cuticle and the appearance of the blunt pointed tail, leave little doubt as to its sex and species.

The cyst which contained the worm measured $\frac{3}{4}$ inch by $\frac{1}{2}$ inch and was too friable to admit of section cutting. Search with a hand lens and films from the inner wall failed to reveal a second filaria or any embryos. Moreover, the absence of embryos from the body of the worm is evidence of its immaturity—a feature also of most of the few recorded specimens of *F. conjunctivæ*.

Measurements.—Length (incomplete) 94 millimetres. Breadth 0.5 millimetre. Thickness of cuticle 7 to 8 microns. Breadth of tail 0.15 millimetre.

As in the male specimen, the cuticle is transparent and marked by very fine transverse striations one to two microns apart and visible throughout the length to the tail.

Viewed by transmitted light under the microscope the substance of the worm, between the cuticular layers on each side, is of a brownish colour

and shows the coarse coils of the uterine tubules throughout the greater part of its length crowded with immature ova measuring three to four microns.

In addition can be seen the fine longitudinal markings of the muscle fibres.

The tail differs from the male in the absence of spicules, in not showing any upward curve, and ending abruptly in a blunt point.

The anus is not visible and there are no papillæ to be seen.

The tip of the tail, viewed from the side shows one of the lateral pits, as described in Grassi's detailed account of the anatomy of the worm, corresponding to the point at which the cavity of the coelom pierces the external cuticle and apparently forms a very short canal measuring four to five microns across.

Previously Recorded Cases in Man.—Though first named by Addario in 1885 as *F. conjunctiva*, this species had been already observed but not named by Dubini, who found the immature female worm measuring 115 millimetres in the eye of a man in Milan.

Addario's specimen of the female worm enclosed in a nodule the size of a pea and measuring ninety-five millimetres, was extracted by Vadela from the conjunctival sac of the right eye of a woman aged 70, a native of Catania in Sicily, in whom a year later a second worm was found in the same eye.

Babes [4] also had described the same species at an earlier date in 1879 and 1880 as occurring encysted in a calcified nodule in the gastro-splenic omentum of a woman in Buda-Pesth. He named it *F. peritonei hominis*. This specimen was an immature female measuring 190 millimetres.

In 1887 Grassi [5] published a full description of the anatomy of the mature female worm and named the species *F. inermis* on account of its "unarmed" appearance due to the absence of papillæ from the head.

The female specimens so far recorded in man range in length from 90 to about 200 millimetres, although met with in horses and asses as short as 50 to 60 millimetres. The question of the difference in length is, however, one depending on the degree of maturity of the worm.

Grassi's *F. inermis* measured about 16 centimetres long and 0.47 millimetre broad. The cuticle was nine microns in thickness, transparent and marked by fine transverse striations throughout the greater part of the length of the worm, but disappearing towards the head and the extreme end of the tail. It presented an outer finely ridged epidermal layer and an inner layer or corium, and below it was visible the coarse longitudinal striæ of the dorsal and ventral musculature. The head (fig. 5) was slightly tapering and truncated, devoid of papillæ, with a very small terminal central orifice, formed by a continuation of the cuticle into the narrow funnel-shaped pharynx which widened out to form the short oesophagus of 6 millimetres length, thence continued on as the main gut.

The greater part of the coelom was occupied by the coils of the uterine tubules which were crowded with embryos, some still within the ova, others free, measuring 350 microns in length and 5.5 microns in breadth with blunted anterior extremity and very thin finely curved tail.

These tubules communicated with a pair of genital tubes which unite a little behind the commencement of the main gut and find an outlet at the vaginal opening piercing the cuticle at a point 0.3 millimetre from the oral aperture (figs. 5 and 6).

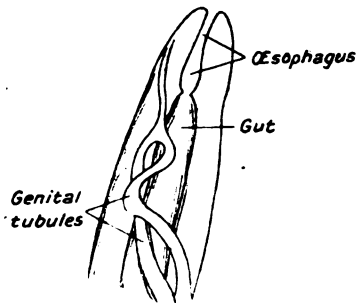


FIG. 5.—Low power.

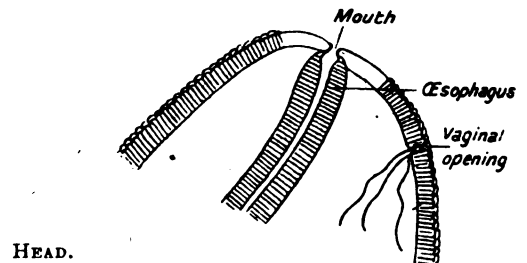


FIG. 6.—High power.

The tail is described as curved with blunt pointed extremity, and the anus, not always visible, as a cleft a short distance above the tip of the tail (fig. 7).

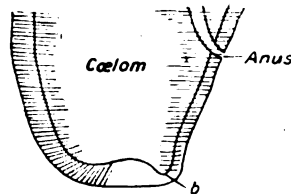


FIG. 7.—Lateral view.

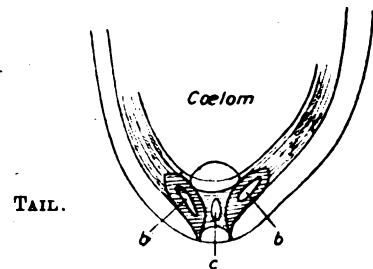


FIG. 8.—Ventral view.

Filaria conjunctiva ♀ (after Grassi). (Addario.)

Viewed from the ventral surface the end of the tail presented a median and two lateral pitted markings suggestive of canalicular orifices but more probably points at which the coelomic cavity comes into close apposition with the external layer of the cuticle (fig. 8).

Grassi considered that his specimen differed from that of Addario and therefore described it under a new name as belonging to a separate species.

But it is now generally agreed that *F. inermis* is synonymous with *F. conjunctiva*, as are also Babes' *F. peritonei hominis*, Pace's *F. palpebralis*

obtained from a cyst in the upper eyelid of a Sicilian native of Palermo in 1887; Revolta's *F. papillosa*, a mature female worm measuring 5½ centimetres found in the eye of an ass in Pisa, and *F. apapiuocephala* of Condoretti.

The most recent example of *F. conjunctiva* was recorded by Alessandrini in 1906.

This case is of particular interest for the site of worm was almost identical with that in Pte. J. B. (Case 1).

A painless tumour had persisted for thirteen months on the outer surface of the upper part of the left forearm of a woman aged 25. Subsequently the arm became painful and swollen, and an abscess which had formed, burst, discharging pus and with it the filaria.

Alessandrini suggests that the infection had been conveyed from a horse or ass through the bite of the *Chrysops excrucians* fly.

REMARKS.

The male filaria obtained from the arm of Pte. J. B. was at first regarded as possibly belonging to the species *Onchocerca volvulus* (Leuckart, 1893), which is well known to occur among the natives of West and Central Africa, giving rise to the formation of subcutaneous nodules in various parts of the body. Native French colonial troops from the Senegal were frequently passing through the hospital and were thought likely to have provided a possible source of infection through the agency of a mosquito or some biting fly.

The question of geographical distribution, therefore, seemed to have been accounted for; and on clinical grounds also there was some support in favour of this filaria belonging to the *Onchocerca*.

Such access as was possible to the literature of *Onchocerciasis* in Salonika showed, however, that though the worm presented certain resemblances in its fine cuticular striation and the absence of papillæ from the head, it was of abnormal length for the male *onchocerca* which has not been recorded longer than thirty-five millimetres, and the tail showed none of the typical papillæ presented by that of the *Onchocerca*; further, it was the only worm present in the tumour. Its identity was, therefore, unsettled.

It was not until my return to England some months later that I had an opportunity of consulting Dr. Leiper, who unhesitatingly pronounced the specimen not to belong to the *Onchocercæ*, on the following grounds:—

(1) The geographical distribution—*Onchocerca* has never been found in Europe or outside Africa.

(2) The structure of the tumour enveloping the worm is more spongy and much less fibrous than in the nodules of *Onchocerca*. The latter also invariably contain at least two female and several male worms and swarm with embryos.

(3) The appearance of the cuticle is quite different; the transverse striations being finer and there being a total absence of the coarse ridge-like cuticular folds common in the *Onchocerca*.

(4) The formation of the tail including the absence of any papillæ is altogether unlike that of *Onchocerca*. Dr. Leiper has further identified the two specimens as being the male and female types of *F. conjunctiva* of Addario, the former for the first time on record.

The anatomical structure and appearance of the two specimens bear every resemblance to this species, whose synonyms have already been mentioned.

F. conjunctiva has hitherto only been found singly usually in a state of immaturity, within the substance of small spongy fibrocystic nodules occurring in the neighbourhood of the eye but not restricted to that region. So far as at present known its geographical distribution is confined to South Eastern Europe.

SOURCE OF INFECTION.

Both cases here described occurred in the neighbourhood of horse or mule lines, but the animals, not being regarded as possible hosts, were not examined.

In elephantiasis (*F. Bancrofti*), and probably also in onchocerciasis (for the two conditions have been found together in a number of instances in Central Africa), the transmitting agent of infection is known to be the *Culex fatigans*, *Anopheles maculipennis*, and probably *Stegomyia fasciata* [7]. It is, therefore, possible that transmission of the embryos of *F. conjunctiva* may be effected by one of these mosquitoes or a biting fly, such as *Chrysops excrucians* or the stable fly *Stomoxys calcitrans*.

PRESENCE OF MICROFILARIÆ IN THE BLOOD.

Neither of the patients, though examined both by day and night, showed any microfilariae. In the existing records of the few cases of *F. conjunctiva* no mention has been found as to the condition of the blood. This and the nature of transmission of infection, as to whether the filarial embryo may develop at the site of its introduction, or, after gaining the blood or lymph circulation, become lodged in a capillary and there give rise to the formation of the fibrocystic tumour, are important points requiring investigation.

OCCURRENCE OF OTHER FORMS OF FILARIASIS IN MACEDONIA.

As the result of inquiries made of several distinguished French and Serbian pathologists, to whom I showed the male specimen in Salonika, including Professor Lisbonne, M. Joyeux and Dr. Hirschfeldt, I learnt that no cases of filariasis at all resembling that of Pte. J. B., had come to light among French or Serbian troops up to June, 1918, also that in spite

of the number of native troops from the Senegal no case of Onchocerciasis had been reported.

This was also confirmed by M. Gau, Pathologist to the Third French Hospital, who was making a special study of the subject of filariasis among native Colonial troops from Madagascar, Senegal and Indo China. He had met with three cases of infection by *F. loa*, and in the course of several hundreds of blood examinations had found the embryos of *F. nocturna* and *F. perstans*, in a certain percentage of African natives, who, as "carriers," thus become potential sources of the spread of filarial disease in Macedonia through the transmitting agency of the ubiquitous mosquito. As a result it is very conceivable that the geographical distribution of filariasis may in future embrace regions where infection by *F. Bancrofti* and *loa* have been quite unknown.

In conclusion, in addition to my indebtedness to Dr. Leiper—without whose kindness and wide experience it was impossible to identify the filariæ, I have to express my special thanks to Captain A. A. Lees, M.C., R.A.M.C., for his help in connexion with Case 1, and his kind thought in forwarding me the specimen and notes of Case 2, to Major Mills and Captain MacDougall for permission to publish this case, and to Lieutenant-Colonel Wenyon, C.M.G., R.A.M.C., for kindly providing me with sections of the tumour from Case 1.

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EPIDEMIC GASTRO-ENTERITIS DUE TO FOOD POISONING.

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PART I.

CLINICAL.

THE following is a brief account of an epidemic of severe gastro-enteritis which appeared suddenly in one of the convalescent depots of the British Expeditionary Force in France during the month of July, 1918, between 300 and 400 men being affected and all admitted to one hospital. A similar, though apparently milder outbreak, with three fatal cases, occurred at Boulogne in April, 1918. In the latter the causal organism appears to have been the *Bacillus Aertrycke* (Newport strain), while in the epidemic here described the *B. Aertrycke* (Mutton strain) was implicated.

On the afternoon of Sunday, July 7, 1918, there were admitted from No. — Convalescent Depot, twenty-four cases suffering from very severe diarrhoea and vomiting; most of these had been ill since the afternoon and evening of the previous day. On the afternoon of July 8, 1918, ninety-one more cases with similar symptoms were admitted. Most of these had been taken ill about the same time as those admitted on July 7, 1918, though not so severely. On July 9, 1918, there were twenty-six more admissions, and on July 10, 1918, there were nineteen. On July 14, 1918, 170 further cases were admitted from the Convalescent Depot, of whom twenty-three were stretcher cases, the remainder having been only slightly affected. On the same day all the cases in the hospital which had been admitted from the Convalescent Depot with symptoms of gastro-enteritis were collected and segregated in Blocks "G" and "H" of the hospital, and after this date a few cases of diarrhoea and vomiting continued to be admitted for several weeks.

Most of the cases were under the care of Captain H. M. Raven, R.A.M.C., and Captain Hector Smith, R.A.M.C. The total number of cases was 360, but of these several were probably of the nature of the simple diarrhoea which was rather common in this area throughout the summer months. The cases were of all grades of severity, from the violent cases, about to be described, down to a condition which consisted merely of looseness of the bowels lasting for a few days.

Symptoms.—The severer early cases all had violent vomiting and retching, accompanied by frequent diarrhoea, which in one case reached thirty calls to stool in one night. The stools were thin, bright green,

and in some cases very offensive. The temperature in the severe cases was raised on admission to about 102° F. (in one case 104° F.), but subsided to normal in all cases within three or four days. Most of these severe cases began to develop symptoms within five to ten hours after partaking of the infected food. The tongue, clean at first, became furred later like the tongue of enteric fever; most patients complained of pain over the region of the stomach, some of colic, and a very few of cramp in the limbs. One of the most noteworthy characteristics, common to all the severe cases, was a palid, pinched and bluish expression of the features. A roseolar eruption on the abdomen was noted in a few cases. After the gastrointestinal symptoms, the signs of circulatory failure were the most noticeable. The heart beat was very feeble, the pulse small but varying greatly in rate (80 to 120) and not being most rapid in the worst cases. So long as the pulse was palpable, the blood-pressure was fairly well-maintained (systolic average 109, diastolic average 75); but the extremities and, in bad cases, the whole body became extremely cold, blue, and clammy. Feelings of faintness and headache were complaints in almost all the cases. These signs suggested the action of some substance which was a heart paralyzant while the arterial tonus remained affected to a less degree.

The fatal cases appeared all to have died from circulatory failure, consciousness being maintained to the end with occasional lapses into low delirium, except in one case where maniacal delirium came on after broncho-pneumonia had set in.

In the less severe cases, either diarrhoea or vomiting was occasionally absent, but all showed a tendency to irregular action of the bowels, sometimes constipation, sometimes diarrhoea, for some weeks after the attack. For several days, or even for two or three weeks, these milder cases complained of faintness and debility. Seven cases proved fatal within ten days of the onset, and about seventy were still unable to leave hospital six weeks after the commencement. Over twenty cases remained so debilitated and liable to intestinal disorder three months afterwards that they were evacuated to the United Kingdom. The mortality-rate was thus about two per cent, while those incapacitated for military duty over a prolonged period reached about ten per cent.

Cause.—A few slighter cases seem to have begun on Friday, July 5, 1918, in scattered companies, "B," "C," "D," and "S," of the Convalescent Depot, and on the following day the outbreak was mainly concentrated in companies, "F," "J," and "K," who had had for dinner "sea-pies," made of meat cooked on the previous day and warmed up on July 6, 1918. It is presumed that these pies were infected when they were made, that the heat of cooking was insufficient to sterilize the pies throughout, and that the bacilli found in them a convenient medium for multiplication overnight and were not killed by the warming for dinner on the morning of July 6, 1918. It should be explained that different companies were grouped together for

dinner in different sections of the dining hall at the Convalescent Depot, although a certain amount of wandering of men, who desired to sit beside friends, took place. Men of the same company therefore tended to be served with food from the same source. The special incidence of the outbreak among men of certain companies is shown by the numbers of the earlier and severer cases arranged under the letter of their company as follows:—

Company	C	D	E	F	H	J	K	L	M	N	O	T
Number of cases	2	1	1	46	1	36	62	2	2	1	1	2

No carrier could be discovered, but a bacillus showing the reactions of *B. Aertrycke* (Mutton strain) was recovered from the spleen in all the fatal cases, as well as from the fæces of six other patients.

BACTERIOLOGICAL REPORT BY CAPTAIN D. C. ADAM, R.A.M.C.

A post-mortem examination was made on the first fatal case and an organism was recovered from the spleen having the following characteristics:—

Lactose	Glucose	Mannite	Litmus milk	Motility	Indol
—	AG	AG	Alkaline (3 days)	—	—

One of the paratyphoid food-poisoning group was therefore indicated. Serological tests showed this organism to be *B. Aertrycke* (Mutton strain). An identical organism was recovered post-mortem from all the fatal cases. The fæces of nineteen of the more acute cases were examined, the usual methods being adopted, and in six of these *B. Aertrycke* was found. Before the cases were discharged from hospital at least one, and in many cases three, negative examinations of fæces were required. In two of these the *B. Aertrycke* was found nineteen days after the presumed date of infection. The kitchen staff, both permanent and temporary, of the Convalescent Depot were also examined, but no carrier was discovered among them.

Morbid Anatomy.—The stomach in the seven fatal cases showed a greater or less degree of congestion, with minute hæmorrhages. The small intestine was congested in places, especially at its lower end, and in several cases showed swelling of Peyer's patches, accompanied in one instance by ulceration. The large intestine in one of the cases showed also a slight degree of congestion. The spleen in some cases appeared approximately normal in size, in others it was enlarged. A constant feature in all the cases was the occurrence of numerous minute hæmorrhages under the epicardium. The kidneys were little affected, showing cloudy swelling of the cortex only. In one case extensive broncho-pneumonia had occurred, in another a condition of necrosis of both parotid glands, and a third had developed a large carbuncle on the neck.

Treatment.—It appeared increasingly evident as the epidemic continued

that one of the most important points in treatment was the early administration of an effective dose of castor oil or calomel. Castor oil did not aggravate the emesis of the patients who were vomiting violently. Various sedatives—e.g., bismuth carbonate, morphia hypodermically, and liquor chloroformi et morphinae by mouth—were given for relief of the pain caused by vomiting; of these the last mentioned, frequently repeated, seemed to be most effective.

As the condition progressed, the chief necessity was to support the patient's strength and the cardiac action; for this purpose frequent small doses of brandy (two drachms) and of champagne, and particularly of strychnine hypodermically (one-thirtieth grain every two to four hours) were found most useful. Saline enemata gave considerable relief to the diarrhoea though they were not retained long enough to be absorbed.

Saline infusions into the veins or subcutaneous tissues appeared to afford temporary benefit in a few of the greatly collapsed cases. The intravenous injection of acacia gum (six per cent) was tried in several of the severe cases, but its use did not appear to afford any relief. In one case of moderate severity, in which it was employed, the blood-pressure fell from 100 millimetres of mercury to forty-five millimetres after the injection of a pint; this patient, however, subsequently recovered. In other cases, rigors followed its administration. The injection of digitalin was tried in some of the collapsed cases, but appeared to have little effect; pituitrin, however, (one-half cubic centimetre, Parke Davis and Co. standardized solution) appeared to strengthen the pulse in several of the most feeble cases.

As regards food, in the worst cases nothing but sips of champagne, of albumen water, of imperial drink, or of white wine whey, could be tolerated for several days. Peptonized milk was tried but was badly borne. Later, beef jelly, arrowroot, Benger's Food, and sweet wine jelly, were taken by different patients. The severer cases were unable, until two weeks had elapsed, to get on to beef tea, bread and butter, eggs and fish; and all cases showed for several weeks a great tendency to diarrhoea and abdominal pain when they were put on more solid diet.

As regards sanitation, the cases were treated on an enteric infectious basis. All stools were disinfected with cresol solution, strict precautions were taken against flies, and special latrines were set aside for the "up" patients. As mentioned above, the patients were collected and quarantined in two special blocks.

CLINICAL CONCLUSIONS.

(1) Infection with the *B. Aertrycke* is apt to result from tainted meat, when the meat is kept in a warm place overnight and thereafter warmed up without thorough cooking.

(2) The first symptoms are of violent gastro-intestinal irritation followed by those of cardiac failure. The temperature rises at once to 102° F. or thereabout, remains elevated for two or three days, and then falls to

normal or subnormal, being thus quite unlike the pyrexia of a typhosus or paratyphosus infection.

(3) Cases may remain carriers for three weeks after infection, and return to health may be delayed for many months.

(4) The most important factors in treatment are the early administration of an effective purgative and thereafter maintenance of the heart's action.

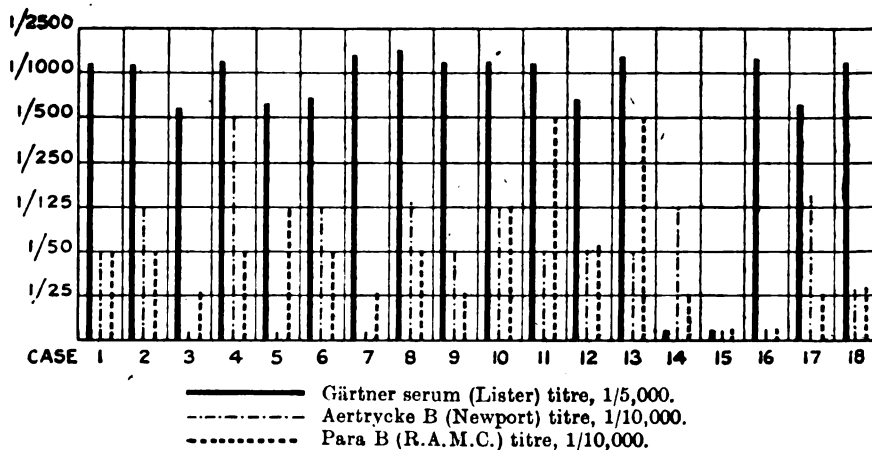
PART II.

BACTERIOLOGICAL.

A bacillus bearing the morphological characteristics and cultural reactions of *Bacillus paratyphosus* B was isolated by Captain Adam, R.A.M.C., from the stools in a certain percentage of cases, and eighteen cultures from different cases were handed over to one of us (G. A. B.) for identification by serological methods.

Agglutination reactions were tried with para B, Gärtner and Aertrycke (Newport) sera and the technique of Dreyer was used. It must be remembered that Aertrycke (Newport), Aertrycke (Mutton) and para B sera each agglutinate all three organisms from stock cultures to an equal degree. These strains were however recently isolated and were therefore unstable to agglutination. Results of agglutination are shown in Table I.

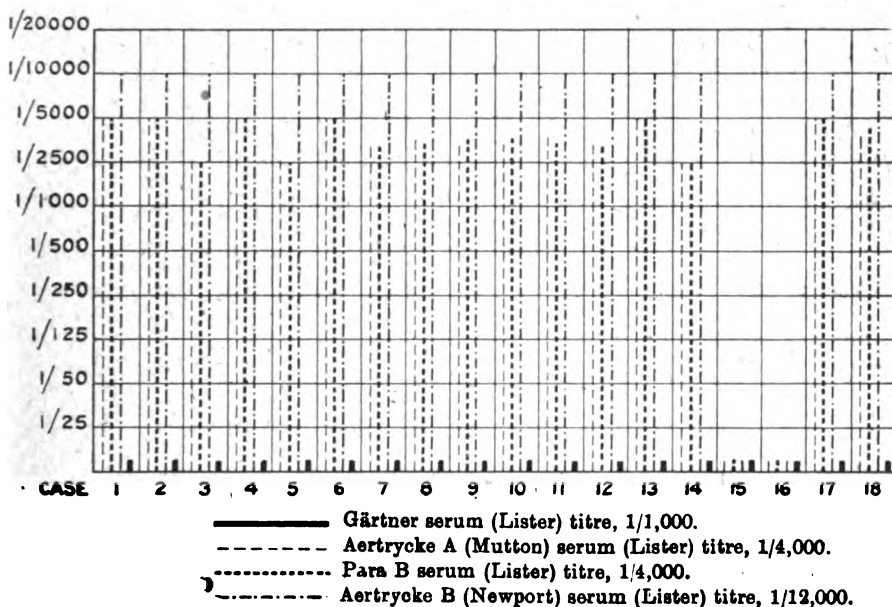
TABLE I.



It will be seen that agglutination took place in high dilutions with Gärtner serum alone. This, however, was not true agglutination as no flocculi were formed, but sedimentation was observed in each tube of the series of dilutions—e.g., an equal degree of sedimentation took place in

both one in twenty-five and one thousand dilutions. With para B and Aertrycke sera agglutination was complete to the dilution shown.

The eighteen strains were then subcultured daily into broth for four weeks and the agglutination tests repeated. Results are given in the following diagram:



Thus it is seen that the organisms when recently isolated behaved differently to agglutination to the same organisms when repeatedly subcultured for four weeks.

Absorption tests were carried out with each strain and with Aertrycke A serum alone did complete absorption of agglutinins occur. The method used was to saturate one in twenty-five dilutions of high titre para B, Aertrycke A and B sera with the strain under test and then to agglutinate the clear centrifuged serum against type strains of para B, Aertrycke A and B suspensions. All strains, with two exceptions, gave identical results, and the outbreak was therefore proved to be due to *B. Aertrycke A* (Mutton.)

AN EXAMPLE OF THE TYPE OF RESULT OBTAINED WITH THE ABSORPTION TEST IS GIVEN BELOW.

Aertrycke A, Aertrycke B, and para B sera all agglutinate up to titre with stock cultures of any of Aertrycke A, Aertrycke B, and para B bacilli.

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Case 2.—Pure sera against organism under investigation.

Sera	Titre	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000	1/25,000
Aertrycke A	1/4,000	+++	+++	+++	+++	+++	+++	+++	+	+	—
„ B	1/12,000	+++	+++	+++	+++	+++	+++	+++	+++	++	—
Para B ..	1/4,000	+++	+++	+++	+++	+++	+++	+++	—	—	—
Gärtner ..	1/1,000	+	—	—	—	—	—	—	—	—	—

Aertrycke A Serum after Saturation with Organism under Investigation.

Stock cultures	1/50	1/125	1/250	1/500
Aertrycke A	..	—	—	—
Aertrycke B	..	—	—	—
Para B	—	—	—

Aertrycke B Serum after Saturation with Organism under Investigation.

Stock cultures	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000
Aertrycke A	..	—	—	—	—	—	—	—
Aertrycke B	..	—	—	—	—	—	—	—
Para B	..	+++	+++	+++	+++	+++	+	—

Para B Serum after Saturation with Organism under Investigation.

Stock cultures	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000
Aertrycke A	..	—	—	—	—	—	—	—
Aertrycke B	..	—	—	—	—	—	—	—
Para B	..	+++	+++	+++	+++	+++	—	—

AGGLUTININ FORMATION IN PATIENTS' SERA.

Agglutinin formation was tested in seven cases of varying severity on one or more occasions. Since all seven had previously been inoculated to T.A.B., it was necessary to eliminate the confusion factor of the presence of para B agglutinins.

To test for the specific agglutinins of Aertrycke two methods were used: (1) The absorption test; (2) Aertrycke (Mutton) bacilli which had been specialized to agglutinate only with Aertrycke (Mutton) serum. The first method was used at the time of the epidemic, the second some months later, when a method of specialization had been discovered. Shortly, this method consists of immunizing a rabbit by feeding with living Aertrycke A bacilli followed by a lethal dose by injection into a vein. The bacilli recovered from the heart blood after death are found to be agglutinated by Aertrycke A serum alone, and not by Aertrycke B and para B sera. Details will be given later.

The two methods gave similar results, but the second being a direct measure of specific agglutinin formation, gave more accurate results. Specific Aertrycke A agglutinins could be detected about the seventh day, and reached a maximum at about the fourteenth day. The extent of their production was roughly proportional to the severity of infection. Three examples of both methods are given below.

Tables A and C show the degree of specific Aertrycke A agglutinin formation, while Table B gives a measure of the added action of specific Aertrycke A agglutinins and para B agglutinins formed in response to T.A.B. inoculation.

TABLE A.—SERA OF PATIENTS AGAINST SENSITIZED AERTRYCKE (MUTTON) BACILLI.

Serum of Case	Day of illness	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000
1	14th	+++	+++	+++	+++	+++	+++	+++	+++	++
"	5	22nd	+++	+++	+++	+++	+++	+++	++	—
"	7	22nd	+++	++	—	—	—	—	—	—

TABLE B.—SERA OF PATIENTS AGAINST NON-SENSITIZED AERTRYCKE (MUTTON) BACILLI.

Serum of Case	Day of illness	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500
1	14th	+++	+++	+++	++	—	—	—
"	5	22nd	+++	+++	+++	+++	+	—
"	7	22nd	+++	+++	++	—	—	—

TABLE C.—SERA OF PATIENTS AFTER SATURATION WITH PARA B BACILLI AGAINST NON-SENSITIZED AERTRYCKE (MUTTON) BACILLI.

Serum of Case	Day of illness	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500
1	14th	+++	+++	++	—	—	—	—
"	5	22nd	+++	+	—	—	—	—
"	7	22nd	+	—	—	—	—	—

For the first three weeks of the investigation, organisms from the patients' stools were in a "phase of lessened agglutinability," and would agglutinate with neither stock sera nor serum taken from the patient from which they were isolated. Stock cultures were therefore used in testing for the agglutinin content of sera.

EXPERIMENTS ON ANIMALS.

From the foregoing it is seen that, when first isolated, the strain responsible for the epidemic was inagglutinable but yet gave rise to agglutinins in the blood of the patients. It was also found to absorb *B. Aertrycke* (Mutton) agglutinins from specific sera during this inagglutinable phase.

Experiments were conducted with rabbits in an attempt to determine the relationship of agglutinability to virulence and also under what conditions the bacillus passed through the phases of diminished and increased agglutinability *in vivo*.

Experiment 1.—Two loopfuls of a culture isolated from the stools of Case 7 were emulsified in sterile saline and injected into the peritoneal cavity of a young rabbit. The agglutination reactions of the culture at the time of injection were as follows:—

Sera	1/25	1/50	1/125	1/250
Aertrycke (Mutton)	—
Aertrycke (Newport)	—
Para B	—

The animal died in eighteen hours, and post-mortem examination showed acute general peritonitis. Petechial hæmorrhages were seen on the pleura and pericardium, and fluid was present in both cavities. Cultures were taken from the heart blood, liver and spleen. All gave growths which were true to *B. Aertrycke* (Mutton) type culturally and morphologically, but were inagglutinable to Aertrycke (Mutton), Aertrycke (Newport) and para B sera.

Case 2.—Pure sera against organism under investigation.

Sera	Titre	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000	1/25,000
Aertrycke A	1/4,000	+++	+++	+++	+++	+++	+++	+++	+	+	—
„ B	1/12,000	+++	+++	+++	+++	+++	+++	+++	+++	++	—
Para B ..	1/4,000	+++	+++	+++	+++	+++	+++	+++	—	—	—
Gärtner ..	1/1,000	+	—	—	—	—	—	—	—	—	—

Aertrycke A Serum after Saturation with Organism under Investigation.

Stock cultures				1/50	1/125	1/250	1/500
Aertrycke A	..			—	—	—	—
Aertrycke B	..			—	—	—	—
Para B	..			—	—	—	—

Aertrycke B Serum after Saturation with Organism under Investigation.

Stock cultures		1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000
Aertrycke A	..	—	—	—	—	—	—	—	—
Aertrycke B	..	—	—	—	—	—	—	—	—
Para B	..	+++	+++	+++	+++	+++	+++	+	—

Para B Serum after Saturation with Organism under Investigation.

Stock cultures		1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000
Aertrycke A	..	—	—	—	—	—	—	—	—
Aertrycke B	..	—	—	—	—	—	—	—	—
Para B	..	+++	+++	+++	+++	+++	+++	—	—

AGGLUTININ FORMATION IN PATIENTS' SERA.

Agglutinin formation was tested in seven cases of varying severity on one or more occasions. Since all seven had previously been inoculated to T.A.B., it was necessary to eliminate the confusion factor of the presence of para B agglutinins.

To test for the specific agglutinins of Aertrycke two methods were used: (1) The absorption test; (2) Aertrycke (Mutton) bacilli which had been specialized to agglutinate only with Aertrycke (Mutton) serum. The first method was used at the time of the epidemic, the second some months later, when a method of specialization had been discovered. Shortly, this method consists of immunizing a rabbit by feeding with living Aertrycke A bacilli followed by a lethal dose by injection into a vein. The bacilli recovered from the heart blood after death are found to be agglutinated by Aertrycke A serum alone, and not by Aertrycke B and para B sera. Details will be given later.

The two methods gave similar results, but the second being a direct measure of specific agglutinin formation, gave more accurate results. Specific Aertrycke A agglutinins could be detected about the seventh day, and reached a maximum at about the fourteenth day. The extent of their production was roughly proportional to the severity of infection. Three examples of both methods are given below.

Tables A and C show the degree of specific Aertrycke A agglutinin formation, while Table B gives a measure of the added action of specific Aertrycke A agglutinins and para B agglutinins formed in response to T.A.B. inoculation.

TABLE A.—SERA OF PATIENTS AGAINST SENSITIZED AERTRYCKE (MUTTON) BACILLI.

Serum of Case	Day of illness	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000
1	14th	+++	+++	+++	+++	+++	+++	+++	+++	+
"	5	22nd	+++	+++	+++	+++	+++	+++	+++	+
"	7	22nd	+++	+	—	—	—	—	—	—

TABLE B.—SERA OF PATIENTS AGAINST NON-SENSITIZED AERTRYCKE (MUTTON) BACILLI.

Serum of Case	Day of illness	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500
1	14th	+++	+++	+++	++	—	—	—
"	5	22nd	+++	+++	+++	+++	+	—
"	7	22nd	+++	+++	++	—	—	—

TABLE C.—SERA OF PATIENTS AFTER SATURATION WITH PARA B BACILLI AGAINST NON-SENSITIZED AERTRYCKE (MUTTON) BACILLI.

Serum of Case	Day of illness	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500
1	14th	+++	+++	++	—	—	—	—
"	5	22nd	+++	+	—	—	—	—
"	7	22nd	+	—	—	—	—	—

For the first three weeks of the investigation, organisms from the patients' stools were in a "phase of lessened agglutinability," and would agglutinate with neither stock sera nor serum taken from the patient from which they were isolated. Stock cultures were therefore used in testing for the agglutinin content of sera.

EXPERIMENTS ON ANIMALS.

From the foregoing it is seen that, when first isolated, the strain responsible for the epidemic was inagglutinable but yet gave rise to agglutinins in the blood of the patients. It was also found to absorb *B. Aertrycke* (Mutton) agglutinins from specific sera during this inagglutinable phase.

Experiments were conducted with rabbits in an attempt to determine the relationship of agglutinability to virulence and also under what conditions the bacillus passed through the phases of diminished and increased agglutinability *in vivo*.

Experiment 1.—Two loopfuls of a culture isolated from the stools of Case 7 were emulsified in sterile saline and injected into the peritoneal cavity of a young rabbit. The agglutination reactions of the culture at the time of injection were as follows:—

Sera	1/25	1/50	1/125	1/250
Aertrycke (Mutton)	—	—	—	—
Aertrycke (Newport)	—	—	—	—
Para B	—	—	—	—

The animal died in eighteen hours, and post-mortem examination showed acute general peritonitis. Petechial hæmorrhages were seen on the pleura and pericardium, and fluid was present in both cavities. Cultures were taken from the heart blood, liver and spleen. All gave growths which were true to *B. Aertrycke* (Mutton) type culturally and morphologically, but were inagglutinable to Aertrycke (Mutton), Aertrycke (Newport) and para B sera.

Experiment 2.—Two loopfuls of a culture isolated from the stools of Case 13 were spread over the surface of a lettuce leaf and were fed to a young rabbit. Agglutination reactions of the culture at the time of feeding were as follows:—

Sera	Titre	1/25	1/50	1/125	1/250	1/500	1/1000	1/2500
Aertrycke (Mutton) ..	1/10,000	—	—	—	—	—	—	—
Aertrycke (Newport) ..	1/10,000	—	—	—	—	—	—	—
Para B ..	1/10,000	++	—	—	—	—	—	—
Gärtner ..	1/5,000	+	+	+	+	+	+	—

The rabbit died on the fourth day after continuous diarrhoea, which came on a few hours after feeding. Post-mortem signs closely resembled those found in patients dead of the infection, and consisted of submucous hæmorrhages of the pylorus and upper nine inches of the small intestine. Cultures were taken from the heart blood and spleen, given two hours in broth and then plated on MacConkey's medium. Pure cultures were obtained in both cases, and these were true to type morphologically and by the sugar reactions. Agglutination reactions were tried twenty-four hours after the post-mortem examination and before the tests for purity had been completed. The agglutination reactions worked out as follows:—

Sera	Titre	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000
Aertrycke (Mutton)	1/10,000	+++	+++	+++	+++	+++	++	+
Aertrycke (Newport)	1/10,000	+++	+++	+++	+++	+++	++	—
Para B ..	1/10,000	+++	+++	+++	+++	++	—	—
Gärtner ..	1/5,000	—	—	—	—	—	—	—

Daily subcultures were made and agglutination reactions repeated with a heat-killed culture six days after the post-mortem examination. It was then seen that the first phase of agglutinability had been succeeded by a phase of inagglutinability. Results were as follows:—

Sera	Titre	1/50	1/125	1/250	1/500	1/1000
Aertrycke (Mutton) ..	1/10,000	—	—	—	—	—
Aertrycke (Newport) ..	1/10,000	—	—	—	—	—
Para B ..	1/10,000	+++	++	+	—	—

Agglutination reactions repeated after three weeks' subculture showed the re-establishment of the phase of agglutinability.

Sera	Titre	1/50	1/125	1/250	1/500	1/1000	1/2500	1/5000
Aertrycke (Mutton) ..	1/4,000	+++	+++	+++	+++	+++	++	—
Aertrycke (Newport) ..	1/4,000	+++	+++	+++	+++	+++	++	—
Para B ..	1/4,000	+++	+++	+++	+++	+++	++	+

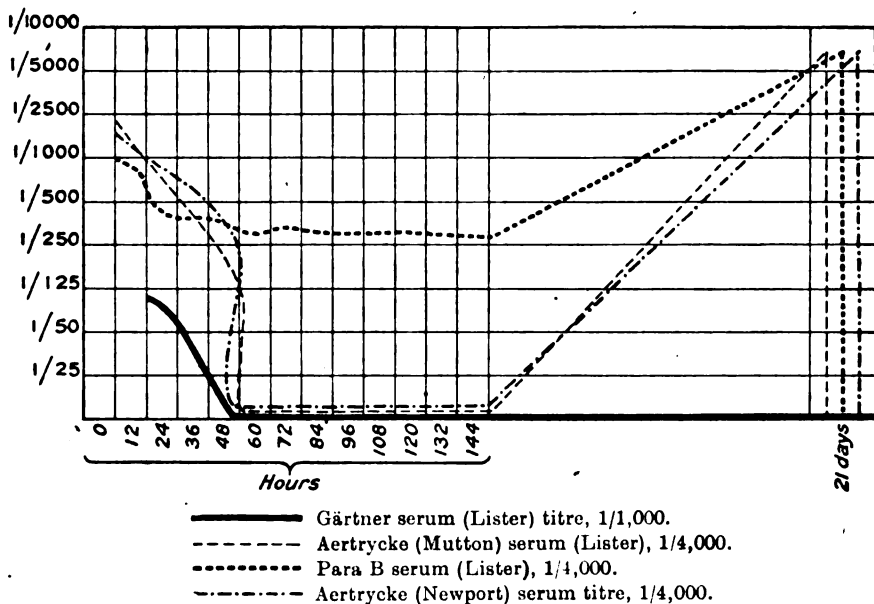
Absorption tests showed the organism to be an unaltered *B. Aertrycke* (Mutton). Thus it was demonstrated that three phases occurred with this organism, the first agglutinable phase, the inagglutinable phase, and the second agglutinable phase depending on the age of the strain *in vitro*.

Experiment 3.—Since from the preceding experiment it was obvious that the time factor *in vitro* determines the degree of agglutination the experiment was repeated and cultures submitted to agglutination at twelve-

hour intervals to establish curves to the phases. The young rabbit selected died five days after receiving a dose by mouth of two loopfuls of a culture isolated from the stools of Case 7. Agglutination reactions of the culture at the time of feeding were as follows:—

Sera		Titre	1/25	1/50	1/125	1/250
Aertrycke (Mutton)	..	1/10,000	—	—	—	—
Aertrycke (Newport)	..	1/10,000	—	—	—	—
Para B	.. ..	1/10,000	+	—	—	—
Gärtner	.. ..	1/10,000	+	+	—	—

Pure cultures of *B. Aertrycke* (Mutton) were isolated from the liver, spleen, portal vein and heart blood. The heart blood culture was selected for daily subculture and agglutination results are given diagrammatically below:—



Experiment 4.—At the end of the period occupied by the preceding experiments, when ninety-three days had elapsed, the bacillus was found to have lost virulence and the opportunity was taken of trying the effect of living Aertrycke bacilli under these conditions on the intestinal mucosa. The culture selected was that isolated from the stools of Case 2 and its agglutination reactions during the period of feeding to a rabbit were as follows:—

Sera	Titre	1/25	1/50	1/125	1/250	1/500	1/1000	1/2500	1/5000
Aertrycke (Mutton)	1/4,000	+++	+++	+++	+++	+++	+++	++	—
Aertrycke (Newport)	1/12,000	+++	+++	+++	+++	+++	+++	+++	++
Para B	1/4,000	+++	+++	+++	+++	+++	+++	+	—

The culture was found to cause malaise accompanied by diarrhoea at the first feeding. This, however, quickly passed off and subsequent doses gave

rise to no symptoms. The following doses were administered by mouth: First day.—Two loopfuls of a twenty-four hour agar slope. Ninth day.—Four loopfuls of a twenty-four hour agar slope. Twenty-first day.—The entire growth from two twenty-four hour agar slopes. Twenty-eighth day.—The entire growth from three twenty-four hour agar slopes. On the thirty-sixth day an intravenous injection was given of approximately 4,000 million living bacilli of the same strain. The animal died in forty-eight hours. Post-mortem examination revealed the following lesions:—

Stomach.—Small sub-mucous hæmorrhages present.

Small Intestine.—The first nine inches of intestine from the pylorus showed marked dilatation with venous congestion. The pylorus joined a sacculus of gut giving an appearance resembling the ileocæcal junction, and at the most dilated portion of this sacculus an ulcer had formed which had perforated but had become plugged by omentum so that no escape of contents had taken place.

Liver.—Six abscesses were present each as large as a marble and each contained thick white caseous material, while the walls were fibrous, giving a cystic appearance. Firm adhesions fixed the upper surface of the liver to the diaphragm and less firmly the under surface of the stomach to transverse colon.

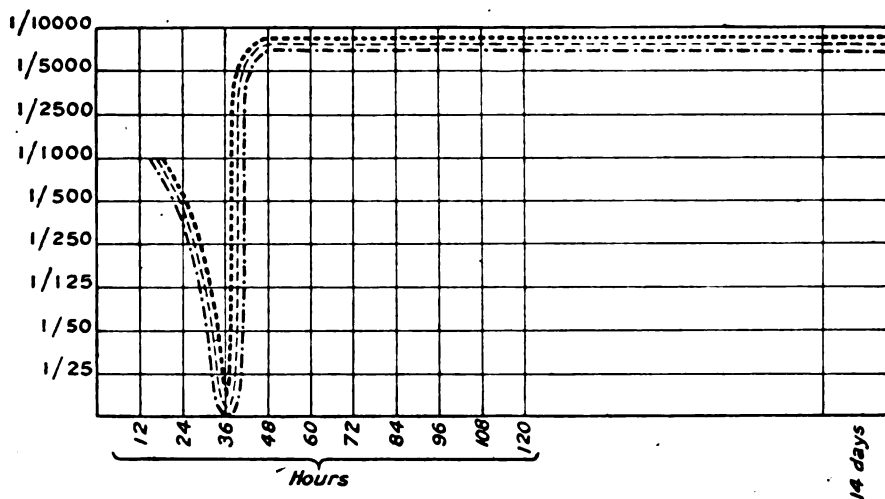
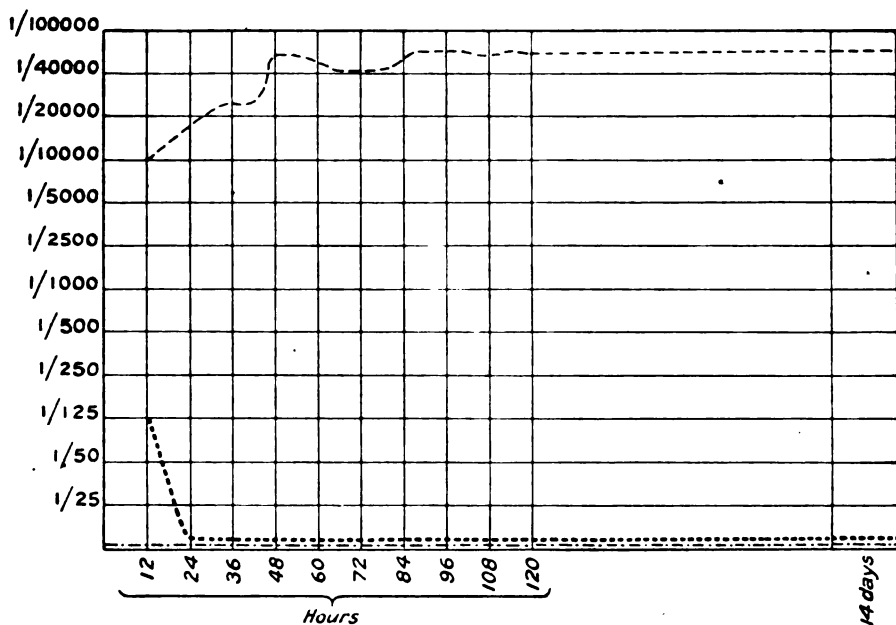
Cultures were taken from the heart blood, spleen, pancreas and from the encysted abscesses of the liver. All gave growths which were true to Aertrycke type by cultural and morphological investigation. Cultures from the heart blood and liver abscesses were selected for detailed investigation of the agglutination reactions and the former may be taken to represent the acute infection as induced by intravenous injection, while the latter may be taken to represent the chronic infection induced by feeding.

Thus from the first diagram the three phases are again obvious. The first agglutinable phase, the inagglutinable phase, and the second agglutinable phase.

In the second, however, changes have taken place and it must be remembered that here an acute infection has taken place in an animal already highly immunized against this infective agent. There the second phase is absent for Aertrycke A serum and the third phase absent for Aertrycke B and para B sera. Also these cultures were found to be constant serologically and *in vitro* no physical conditions such as varying the culture media, altering the saline content of the fluids in which they were suspended, etc., were found to affect these serological properties.

It is seen that the strain has become specialized and sensitized—specialized because it is now only affected by its primary agglutinins, sensitized because it will agglutinate with serum dilutions far beyond the titre of the serum.

The importance of this strain is obvious. It can be used directly against an unknown serum and the absorption test obviated. Thus in a case of suspected Aertrycke infection the patient's serum will agglutinate

Agglutination of Liver Abscess Cultures.*Agglutination of Heart Blood Cultures.*

- Aertrycke (Mutton) titre, 1/4,000.
- Aertrycke (Newport) titre, 1/12,000 sera.
- Para B titre, 1/4,000.

Aertrycke suspensions owing to the presence of co-agglutinins formed in response to T.A.B. inoculation. Using this specialized strain, however, these co-agglutinins due to T.A.B. inoculation will have no effect while primary Aertrycke A agglutinins will be detected in smaller quantities than can be discovered by the ordinary methods.

During this experiment serum was taken from the rabbit on the seventeenth day and on the thirty-eighth day, when death took place.

Agglutination reactions of the serum are given below:—

<i>Seventeenth Day.</i>													
	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000	1/20,000	1/40,000	1/100,000	
Aertrycke (Mutton) specialized	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	++	-	
Aertrycke (Mutton) stock	+++	+++	+++	++	-	-	-	-	-	-	-	-	
Aertrycke (Newport) stock	+++	+++	+++	++	-	-	-	-	-	-	-	-	
Para B stock	+++	+++	+++	++	-	-	-	-	-	-	-	-	
<i>Thirty-eighth Day (after Death).</i>													
Aertrycke (Mutton) specialized	+++	+++	+++	+++	+++	+++	+++	+++	+++	++	-	-	
Aertrycke (Mutton) stock	+++	+++	+++	+++	+	-	-	-	-	-	-	-	
Aertrycke (Newport) stock	+++	+++	+++	++	+	-	-	-	-	-	-	-	
Para B stock	+++	+++	+++	+++	+	-	-	-	-	-	-	-	

Experiment 5.—In order to confirm the results of the last experiment, another rabbit was immunized by feeding and subsequently killed by an intravenous injection. The culture selected was first passed through a series of mice and though by this means its virulence to these animals was raised, the virulence to rabbits was probably lowered. When fed to the rabbit the culture agglutinated to the three sera as follows:—

Aertrycke (Mutton) Titre	..	1/4,000	Complete agglutination at	1/5,000
Aertrycke (Newport) ..	..	1/12,000	..	1/10,000
Para B ..	..	1/4,000	..	1/5,000

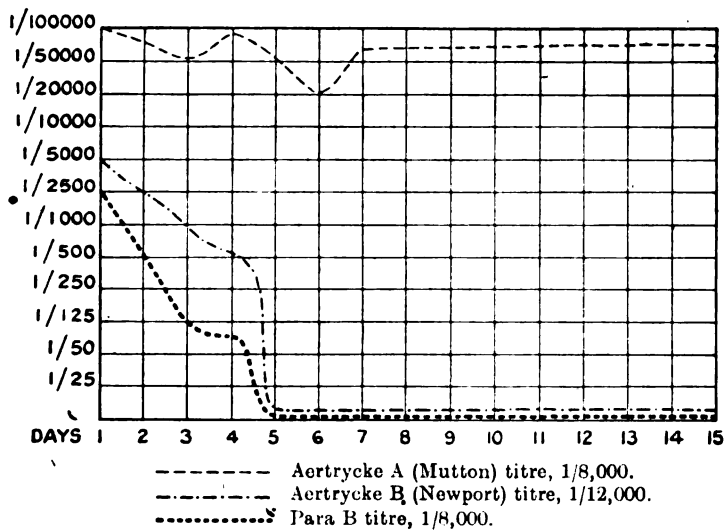
The following doses were administered by mouth: First day.—Four loopfuls of a twenty-four hour agar slope (living cultures). Second day.—The whole of one twenty-four hour agar slope (living cultures). Sixth day.—The whole of two twenty-four hour agar slope (living cultures). Thirteenth day.—The whole of four twenty-four hour agar slope (living cultures). Twenty-fourth day.—The whole of four twenty-four hour agar slope (living cultures). Twenty-ninth day.—The whole of six twenty-four hour agar slope (living cultures). Thirty-third day.—About 4,000 million

living bacilli by intravenous injection. The animal died forty-eight hours after the injection having shown no signs of illness during the period of feeding.

At post-mortem examination few lesions were seen. There were no liver abscesses as in the preceding experiment, nor were adhesions present. The intestine was not dilated, but a subacute inflammatory condition was evident on examination of the interior of the first eight inches of small intestine. Cultures were taken from the liver, spleen, heart blood and portal vein. In this case, spleen, liver and heart blood cultures showed the three phases to all three sera to an equal degree and were therefore not altered fundamentally to agglutination.

Agglutination was, however, sensitized, in that all three sera were active far beyond their respective titres. Spleen cultures, on the contrary, were both sensitized and specialized as is evident from the following chart, which needs no further comment:—

Agglutination of Spleen Cultures.



Experiment 6.—A rabbit was immunized by weekly increasing intravenous injection of dead specialized bacilli isolated from the heart blood in Experiment 4. This dead culture had the following agglutination reactions:—

Sera	Titre	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000	1/20,000
Aertrycke (Mutton)	1/4,000	+++	+++	+++	+++	+++	+++	+++	+++	++	—
Aertrycke (Newport)	1/12,000	—	—	—	—	—	—	—	—	—	—
Para B ..	1/4,000	—	—	—	—	—	—	—	—	—	—

The serum was tested on two occasions and it was found that both primary and secondary agglutinins were formed. The primary agglutinins, however, were in excess of the secondary in contrast to the next experiment, when dead cultures of a non-specialized culture were used. Results are given below :—

Agglutination. Reactions of Rabbit Serum.

Eleventh Day.

	1/25	1/50	1/125	1/250	1/500	1/1,000	1/2,500	1/5,000	1/10,000	1/20,000	1/50,000	1/100,000	1/5,000,000
Specialized Aertrycke (Mutton)	+++	+++	+++	+++	+++	+++	+++	+++	++	—	—	—	—
Non-specialized Aertrycke (Mutton)	+++	+++	+++	+++	+++	+++	+++	+	—	—	—	—	—
Aertrycke (Newport)	+++	+++	+++	+++	+++	++	—	—	—	—	—	—	—
Para B	+++	+++	+++	+++	+++	++	—	—	—	—	—	—	—

Fortieth Day.

Specialized Aertrycke (Mutton)	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	++	—
Non-specialized Aertrycke (Mutton)	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	++	—	—
Aertrycke (Newport)	+++	+++	+++	+++	+++	+++	+	—	—	—	—	—	—
Para B	+++	+++	+++	+++	+++	+++	++	—	—	—	—	—	—

The attempt, therefore, to produce a serum containing primary agglutinins only, failed.

Experiment 7.—A young rabbit was immunized by intravenous injection of increasing doses of dead non-specialized cultures and finally killed by injection of a lethal dose of living organisms. Cultures were taken from the heart blood, spleen, liver, portal vein and kidney. All grew pure cultures culturally and morphologically true to Aertrycke type. These cultures were also found to be sensitized to agglutinate with sera beyond their titre, but in no case was a specialized strain isolated, and all followed the same curve when put up against any of Aertrycke (Mutton), Aertrycke (Newport) and para B sera.

This immunization by intravenous injection of dead cultures presents points of difference to that produced by the same organisms living in the intestinal mucosa.

BACTERIOLOGICAL CONCLUSIONS.

The organism responsible for the epidemic of acute hæmorrhagic gastro-enteritis was proved to be *B. Aertrycke*-Mutton strain.

This organism was isolated from the stools of a certain percentage of cases and from the spleen of those dead of the disease.

When fed to rabbits the disease was reproduced, and post-mortem examination showed similar pathological changes to those found in patients dead of the disease.

When first isolated during the epidemic all strains were found to be inagglutinable, but became agglutinable up to the full titres of the sera used on subculture for three weeks.

By feeding experiments on rabbits certain distinct phases to agglutination were demonstrated: (1) the first agglutinable phase; (2) the inagglutinable phase; (3) the second agglutinable phase.

The first agglutinable phase was of short duration, and varied from forty-eight to ninety-six hours after the culture was first taken. During this phase agglutination was unstable, and definite conclusions as regards the identity of a strain could not be arrived at apart from the absorption test—e.g., Aerttrycke bacilli were liable to react to Gärtner sera.

The inagglutinable phase varied in length of time, and presumably all the specimens received during the epidemic were in this phase. In these the phase was of long duration—between fourteen and sixteen days—as compared to one day only for cultures isolated from the liver in Experiment 4.

In the large majority of cases failure to agglutinate was complete, but in a few the zero line was not reached as in the para B curve in Experiment 3.

The second agglutinable curve once begun lasted indefinitely, and results of agglutination could be taken as certain indication of identity.

In all phases organisms were capable of absorbing their primary and secondary agglutinins.

Virulence and agglutinability seemed to bear no direct relationship to one another, but when once a strain had reached the second agglutinable phase its virulence was always found to be low.

Sensitized cultures—i.e., cultures agglutinating with sera far beyond their titre as measured against stock cultures, were obtained by injection of a lethal living dose into an animal previously immunized.

If immunization had been effected by the action of living organisms, strains were obtained which were not only sensitized but also specialized.

The specialized strains had several important characteristics.

They would only agglutinate with specific sera containing their primary agglutinins, and were extremely sensitive to these.

They were entirely unaffected by sera containing only secondary agglutinins.

They, nevertheless, absorbed both primary and secondary agglutinins and gave rise to the production of both primary and secondary agglutinins on injection into animals.

They were stable and were unaffected by alterations in these conditions of growth or of alterations in their culture media.

They did not show the three phases.

They were particularly useful in testing sera directly for Aertrycke agglutinins in cases where the patients had received T.A.B. inoculation, and were found to give more accurate results and to furnish a more delicate test than could be obtained by the absorption method.

Chronic Aertrycke infection seems to be of rare occurrence.

In the sera of 122 cases of diarrhœa examined for Aertrycke agglutinins by means of specialized bacilli only one positive was obtained. In this case, Aertrycke (Mutton) bacilli were isolated from the stools at the ninth attempt.

Experiments are proceeding with a view to obtaining sensitized and specialized strains of other organisms, particularly *B. paratyphosus* A and B.

UPWARD ENLARGEMENT OF THE LIVER.

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DURING the past eighteen months we have seen a considerable number of cases of upward enlargement of the liver, in addition to some twenty cases of amoebic hepatitis and liver abscess seen by one of us (R.A.P.H.), in China in 1912-13. The following notes are based on the records of thirty-one of these. To avoid any doubt about the interpretation of the physical signs, we have excluded several who gave a history of past lung trouble or a strong family history of phthisis; and we have regarded as definitely amoebic only those who yielded to emetine treatment and who gave a history of diarrhoea or dysentery traceable to a known centre of amoebic infection, amenable to emetine, or associated with amoebæ or cysts of *Entamoeba histolytica*; also two cases of liver abscess.

Etiology—

Definitely amoebic	..	..	..	..	..	17
Undetermined	..	..	..	..	..	8
Malaria	..	..	..	..	..	3
Malaria with pyæmia	..	..	..	..	..	1
Tuberculous peritonitis with adhesions	..	..	..	..	..	1
Post-operative jaundice	..	..	..	..	..	1
						<hr/> 31

Signs.—The cardinal signs of this condition are: (1) Displacement of the heart upwards and to the left; (2) an abnormally high liver dullness; and (3) the appearance of areas of impairment in certain parts of the lung, due, apparently, to relaxed tension. The elastic tissue of the lung is normally on the stretch, and the first effect of reducing the size of the cavity it fills is to relax that tension; compression, properly speaking, does not occur till after complete relaxation.

Method of Examination.—To examine the front of the chest, let the patient lie flat on his back with only one pillow, the shoulders in contact with the bed, the hands at the sides reaching down towards the knees, all muscles relaxed. To map out the heart and liver, it is not necessary to use either very light or very heavy percussion; the borders can be accurately marked by using moderate force if the attention is concentrated on the musical pitch of the note exclusive of all other qualities. A sharp rise in pitch indicates the edge of the organ quite as accurately as the

heaviest percussion. By X-ray examination we found that the line so marked out corresponded exactly with the outline of the heart, except that the shadow of the great vessels in the third right space lay outside it; the upper, left, and lower borders were exactly found. The line given both back and front as the upper limit of liver dullness during quiet breathing was just crossed by the shadow of the diaphragm at the end of normal expiration, being a little above the mean position of the diaphragm shadow during respiration. In the normal chest the liver dullness so found begins at the fifth rib; the note in the fourth space in the nipple line is not appreciably different from the note in the third space. When the liver is enlarged upwards, the note is distinctly higher pitched. This sign (which, of course, may be found in several other conditions), is practically always evidence of some abnormality. The other common causes are pleural thickening, and pleural effusion. But pleural thickening and adhesions at the right base are commonly associated with displacement of the heart to the right, and the tidal resonance is small or absent; in hepatitis the heart is displaced to the left, and the tidal resonance is commonly normal, though it is often diminished in acute or suppurating cases. On the other hand, it is distinguished from effusion, which also displaces the heart to the left, by the fact that there is much less loss of breath-sounds over the dull area, and that the upper margin of the impairment remains vertical to the bed when the patient is lying on his back.

Attention should also be given to the presence of other areas of higher-pitched resonance (early impairment) in abnormal situations. In well-marked cases there is a band of such impairment above the liver dullness, but with not so sharp a margin, so that the third space may be higher-pitched than the second; also over the inner border of the apex between the heads of the sternomastoid. The importance of these will be discussed later.

To examine the back of the chest let the patient sit up comfortably with the knees bent; better still, let him sit on the edge of the bed with his feet on the floor. The head and trunk must be inclined a little forward, the shoulders rounded and dropped, the hands resting on the knees if sitting out of bed—otherwise reaching down towards the ankles—the thumbs in either case touching in the middle line, and the elbows not supported. The posture must be absolutely symmetrical, and the muscles entirely relaxed.

In this position the upper border of the liver dullness is made out as before, percussing down the back midway between the scapular border and the vertebral spines. Normally, the pitch of the note gets steadily lower from apex to base till the level of the tenth spine is reached, when it rises sharply; absolute dullness begins at the level of the eleventh spine or just below it. When the liver is enlarged upwards we find the level of impairment at the ninth or eighth spine, often with a belt of slighter impairment above it. We also invariably find some or all of three other signs, usually on the right side, sometimes on both. These signs are:—

(1) Lowering of Goldscheider's line (the upper limit of resonance close to the vertebræ).

(2) Retraction of Kronig's isthmus (the band of resonance between the mastoid and acromion processes), and blurring of one or both of its margins; and

(3) A patch of impairment about two inches to the right of the third and fourth vertebral spines (to the left on the left side).

On the left side of the back the level of impairment in these cases slopes down, making an angle of about forty degrees with the horizontal, and runs into the back of the spleen dullness. When the liver is much enlarged, or in a case of left lobe abscess, the signs may be better marked on the left side than on the right, and this may be the case when the abscess is in the right lobe. (They may also be found on the left side in acute or extreme enlargement of the spleen.)

If the muscle wall is thick it is better to percuss rather harder than in front; Kronig's isthmus is best examined by very light percussion; the patch opposite the third and fourth spines is sometimes best found by light percussion, but it is usually quite plain to ordinary percussion.

It will be seen that the three last-mentioned signs are among those described by the apostles of light percussion as characteristic, though not absolutely pathognomonic, of early tubercle; their presence, therefore in a condition in which the disease is wholly below the diaphragm is of considerable practical and theoretical importance. Of practical importance because a mistake in diagnosis is easy, especially when pleurisy or hæmoptysis is present. Several of our cases have been suspected of tubercle by competent physicians; and indeed the distinction is sometimes almost impossible without laboratory aid and X-rays, and may finally have to be made by observing the effect of emetine. Of theoretical, because it is evident that these patches of altered note in early tubercle do not necessarily mean disease of the underlying area of lung, since they may be produced by a condition in which there is no disease of the lung at all. Our suggestion is that the cause of these patches is in both cases the same, relaxation of the lung tissue consequent on an alteration in the mean position of the diaphragm. In other words the "new" methods of examination make evident to percussion that sign which has long been recognized by radiographers as strongly suggestive of early phthisis, impaired movement of the diaphragm. In phthisis the movement is restricted and the diaphragm remains at or near the position of normal expiration; in upward enlargement of the liver the movement is often quite good; but the tone of the diaphragm is relaxed so that it now oscillates about a new mean level, which is often above the normal level of expiration. In the one case the lung is at rest, in the other it is moving, but in both it is relaxed; and the distribution of impairment in either case is that of a lung relaxed from any cause. It is hardly necessary to point out that an

enlarging liver cannot push itself upward by force until it has first very considerably enlarged downwards, except in rare instances when adhesions prevent this. This disproportionate upward enlargement must be due to relaxed tone of the diaphragm, whether it be a reflex or due to the

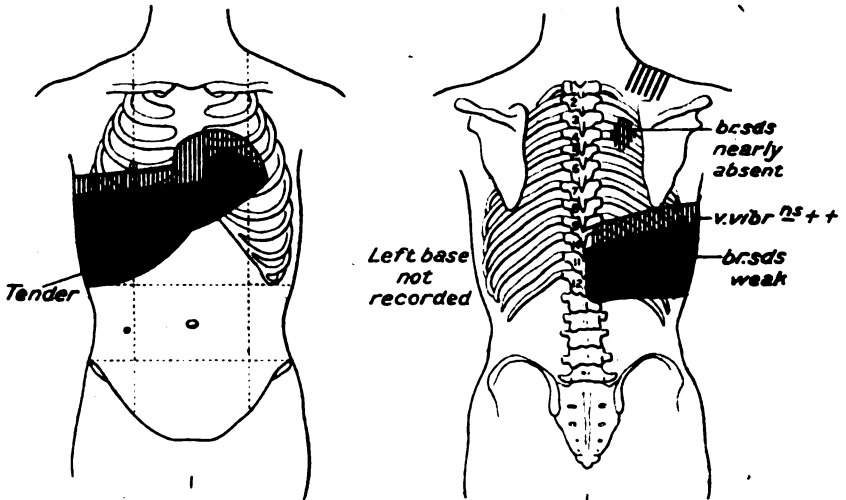


CHART I.—Pte. B. (Case 17), September 9, 1916.

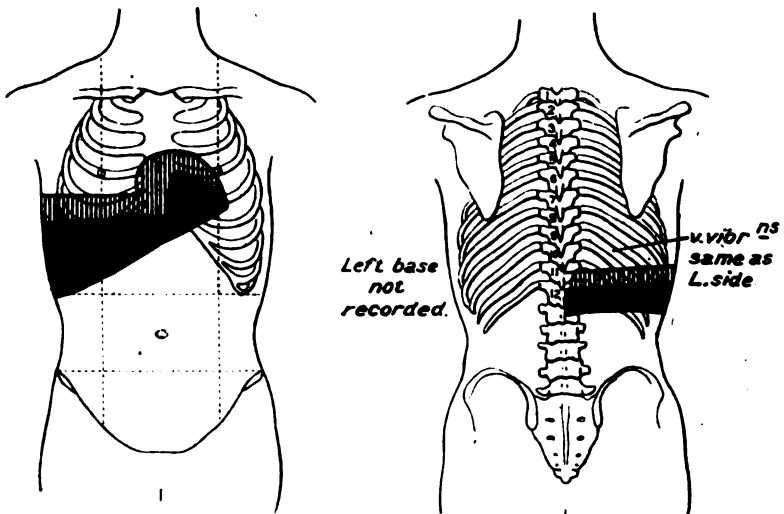


CHART Ia.—Pte. B.—September 25, 1916. After treatment.

spread of inflammation to it; comparable perhaps to the dilatation of an inflamed heart.

These patches do not disappear after a few long breaths, and so cannot be due to a purely temporary non-inflation. The breath-sounds over them

are as a rule distinctly weaker than in the corresponding area on the other side; they may have a "sticky" character, and sibilus is occasionally localized to them; expiration is usually prolonged. Vocal vibrations are sometimes distinctly increased over them, particularly in the region just above the liver dullness.

These signs have been found in every case in which we have looked for them—some forty or fifty cases—though it was impossible to keep proper records of a good many of them owing to the press of work at the time. In every case in which the liver has been reduced by emetine the signs have much diminished, though they have several times been still appreciable when the liver dullness had apparently returned to normal. This is no wonder when it is remembered that the liver dullness is a linear measurement, while the diminution of the thoracic cavity is cubical; and so a forty per cent increase in the bulk of the liver will barely make half an inch difference in the width of the liver dullness.

The accompanying Charts illustrate these points.

Charts I and Ia (from Case 17 below) show the displacement of the heart and the impairment and altered breath-sounds at the right upper and lower apices. The patient had diarrhoea dating from dysentery on the Peninsula, tenderness over the colon and under the right ribs, and a dry cough provoked by lying on the left side; all disappeared after a course of emetine and ipecacuhana.

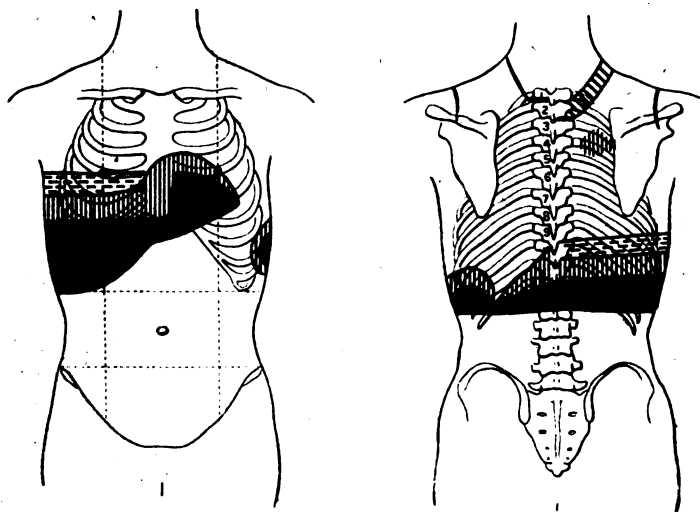


CHART II.—Pte. Mg., (Case 16), April 3, 1917.

Chart II (from Case 16) shows very slight upward enlargement, but the heart is displaced to the left, and there is a band of impairment in the fourth space above the liver dullness. The apical signs were also very definite. The patient had had dysentery in Egypt in 1915 and frequent

mucous diarrhoea since. *E. histolytica* cysts were found; he had occasional attacks of fever to 99.5° F. without malarial parasites.

Chart IIa is from the same patient after one week of emetine injections. The only remaining signs are a very narrow fringe of impairment in the

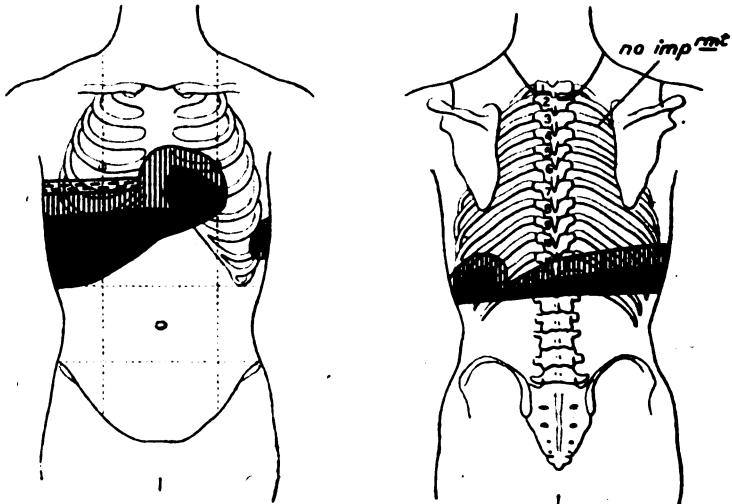


CHART IIa.—Pte. Mg., April 12, 1917.

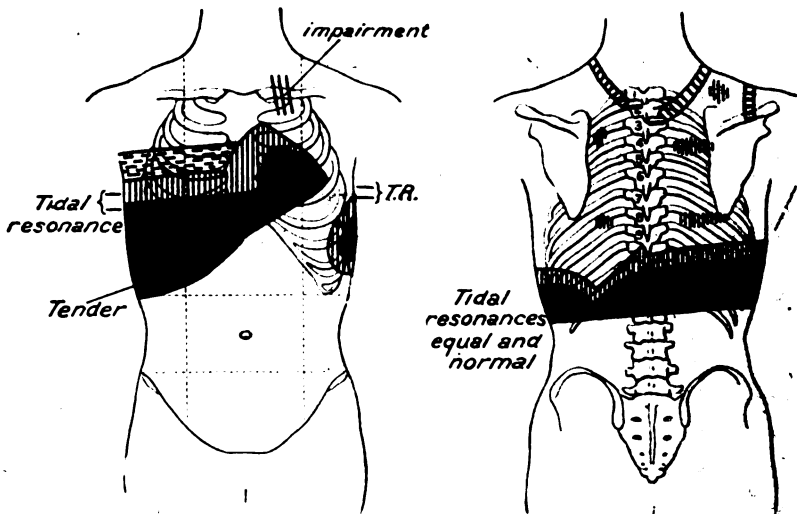


CHART III.—Serjt. P. (Case 11), April 10, 1917.

lower part of the fourth space, and slight lowering of Goldscheider's line on the right side.

Chart III (from Case 11) shows considerable enlargement of the liver. The patient had been in close contact with men who had had dysentery on

the Peninsula; he himself had had dysentery, and *E. histolytica* cysts were abundant in the stools. He had fever to 100.5° F. After six injections of emetine our note is that the heart has come in and the liver is smaller; but on our substituting pills of emetine-bismuth-iodide he relapsed and the signs reappeared, though not quite so markedly. He was X-rayed and the results of percussion confirmed, though nothing was visible with the screen at the apices of the lungs. The pills were recovered in full weight from the stools. At this stage the hospital was disbanded and we lost sight of him. Particularly noticeable is the lifting of the heart, and the relaxation of the left upper lobe.

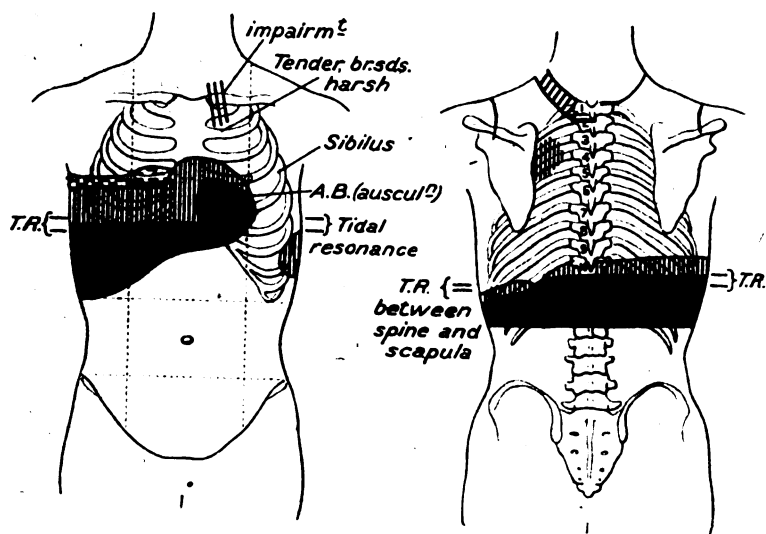


CHART IV.—Pte. H. (Case 1), February 29, 1916.

Chart IV (from Case 1) is of a left lobe liver abscess. This patient's temperature fell at once to normal from 101° F. with emetine, and the signs diminished, but some days later he suddenly developed pericarditis, and next day had a big pericardial effusion. A large thick-walled abscess was found in the left lobe and treated by aspiration and hypodermic injections of emetine with recovery. Forty-three ounces of pus were removed, the pericardium was left alone and gave no more trouble, the effusion disappearing very quickly. He had shoulder-pain on the left side with pain and tenderness in the second intercostal space at the sternal end, which was not increased by pressure on the liver nor removed by emetine before aspiration. The first pain of the pericarditis was felt here and presumably it was a pericardial phenomenon. Note the very small tidal resonance at the left base behind. The X-ray report was "Upward enlargement of the liver."

Chart V (from Case 2) is of an abscess, probably in the right lobe, which was actually in process of being coughed up. The lung signs were well-marked on both sides, but the pain was on the right side and the tidal resonance was very small at the right base. The patient had had three days' "hæmoptysis," and with the onset of the "hæmoptysis" the temperature had fallen to nearly normal. He was suspected of tuberculosis but a course of emetine cleared up all the signs and symptoms of lung trouble.

Even as here classified amoebic cases form a majority ; but of the eight undetermined cases at least five were probably amoebic, though the evidence was not complete ; several of these were seen only once and we

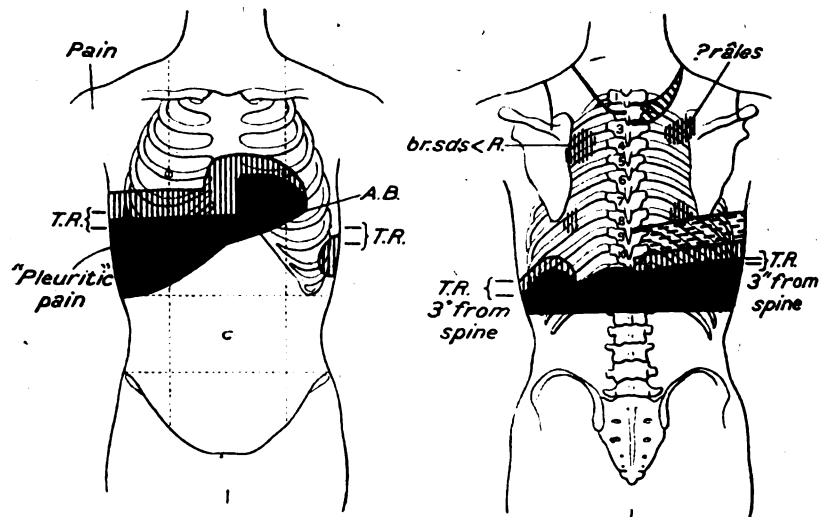


CHART V.—Lieutenant R. (Case 2), March 28, 1916.

could not watch the effect of treatment. There are also several cases excluded on account of a possibility of tuberculosis in the lungs who had definite amoebic hepatitis as well. On the whole, therefore, it is safe to say that amoebiasis is the commonest cause of disproportionate upward enlargement of the liver, except when it occurs as part of an acute attack of malaria ; in which case the spleen is enlarged too and either soon becomes palpable or rises into the thorax behind, giving rise to signs of lung relaxation on the left side.

The table gives the main points of the history, signs and symptoms of the seventeen definitely amoebic cases. Particularly interesting is the list of provisional diagnoses with which they were sent to hospital. Four were P.U.O., two came labelled lumbago or myalgia, and many more complained of "lumbago" or "kidneys" ; three came in as D.A.H., two as

pleurisy, one as influenza; these three were suspected of tuberculosis. The rest were admitted for diarrhoea and dysentery.

Pain was felt chiefly in the back in 5 cases, in the epigastrium in 2, in the hypochondrium in 1, beneath the clavicle in 2, in the shoulder in 2; in the rest there is no note of pain. Subcostal tenderness is recorded in five cases, in four of which pain was referred to other parts; in the acute dysenteric cases it was not possible to distinguish it from the general abdominal tenderness, which is often more marked on the right side than on the left in amoebic dysentery.

Fever was low and irregular in most of these cases; in none did it exceed 101° F.

Jaundice figured in the history of the two cases of abscess at the onset of illness. Probably it was not due to the amœbiasis but predisposed to the formation of abscess; epidemic jaundice was prevalent at the time. It is very singular that abscess should be so rare when hepatitis is so common; but as alcoholic excess is well-known to be a potent predisposing factor, it is not unreasonable to suppose that the temperate, active life on service greatly increases the resistance of the liver.

The blood-counts present some points of interest. Those of two definite cases bear out the statement of Rogers that a leucocytosis with but little alteration in the percentages is found; but this is of less practical value than we had hoped for it does not appear to be pathognomonic. Moreover it is very necessary to know how the counts of normal people run; and (whether inoculation be the cause or no) the percentage of polymorphs both in health and disease in Malta was found to be lower than it usually is at home. A series of 103 counts was done by one of us (R.A.P.H.), and only four times did the polymorphs reach eighty per cent; 2 of these died shortly after, 1 of meningitis, 1 of septic pyæmia, 1 had relapsing fever with a very high temperature, and 1 had appendicitis and had not been inoculated. Inflammatory conditions with counts of 17,500 gave only 72 to 77 per cent of polymorphs, and in normal people and convalescents they were usually below 60 per cent. On the other hand counts of over 14,000 with less than 70 per cent of polymorphs were found nine times in eight cases, five of whom had symptoms of liver trouble, but in none of whom did the results of laboratory examination or treatment support a diagnosis of amœbiasis. We subjoin the counts, and below we give seven counts done on two definite cases (Cases 1 and 15 of the table) for comparison. All counts are based on from 250 to 800 cells, usually about 600. The diluent used was a freshly-made mixture of Leishman's stain (suitably diluted with a little methyl alcohol), one part, and acid-free distilled water, three parts. This is mixed immediately before use, well shaken, and air excluded till the blood is being taken. The blood is diluted with this mixture in the counting pipette to four per cent and counted with the hæmocytometer; the absolute and differential counts can be done in one operation. If the Leishman's stain

Upward Enlargement of the Liver

No.	Name	Abdominal History	Path. Report	Fever	Pain	Tenderness	Provisional Diagnosis	LEVEL OF IMPAIRMENT		Effects of Emetine
								Front	Back	
1	Pte. H.	Dysentery on Peninsula	<i>E. coli</i> cysts	101	Left shoulder and below left cavicle	2nd left rib	Influenza (? tuberculosia)	3rd space	Above 9th spine	Temp. fell to normal * (1)
2	Lt. R.	Dysentery, Nov., 1915	<i>E. coli</i> cysts * (2)	"high"	Right side and shoulder	—	Pleurisy	4th space	Above 9th spine	Improvement (3)
3	L/Cpl. W.	Diarrhoea in Egypt	Active amœbæ	99.8	Stomach	Subcostal	P.U.O.	"Liver enlarged"	"Liver enlarged"	Signs disappeared
4	Pnr. J.	Dysentery on and after Peninsula	Amœbæ	99.5	Back	—	P.U.O. and bronchitis	"Obviously raised back and front"	Liver became normal	Liver became normal
5	Dr. Mc.	Diarrhoea in and after Egypt. Dysentery.	Amœbæ	101	Back and sides	—	Dysentery	4th space	"", "	Liver normal; constipation
6	Pte. W.	Dysentery on and after Peninsula; much diarrhoea	Lamblia cysts	100	—	—	Dysentery	4th rib	Above 9th spine	Liver, bowels, and temp. normal
7	L/Cpl. B.	Dysentery on Peninsula	Amœbæ	100	R. subclavian region and back	R. subcostal	P.U.O. and lumbago	4th rib	9th spine	Signs almost gone on second course * (4)
8	Serjt. S.	Diarrhoea on Peninsula; dysentery	—	(? malaria)	Lumbar	R. abdomen	Diarrhoea	4th rib	9th spine	Liver normal; no diarrhoea
9	Lt. E.	Dysentery, 1901, in South Africa	<i>E. histolytica</i>	100	Epigastrium	—	(a) P.U.O.	5th rib * (5)	9th spine	Liver signs and dysentery disappeared
10	Pte. Wd.	Dysentery, 1917, in Salonica	<i>E. hist.</i> cysts	(? malaria)	—	—	(b) Pleurisy	4th space	Above 9th spine	Liver signs disappeared
11	Serjt. P.	Dysentery, 1917, in Salonica * (6)	<i>E. hist.</i> cysts	100.5	—	R. subcostal	D.A.H.	3rd space	9th spine	Signs improved on injections

12	Pte. M.	Dysentery on and after Peninsula	<i>E. histolytica</i>	none	—	R. iliac fossa	Dysentery	4th rib	9th spine	Liver signs and diarrhoea disappeared
13	Dr. H.	Contact with Peninsula convalescents in Egypt; dysentery later, then diarrhoea	—	none	R. subcostal	R. subcostal	Diarrhoea	4th space	9th spine	Liver signs and diarrhoea disappeared
14	Pte. McG.		Amoebae	—	—	—	Diarrhoea	"enlarged"		Diarrhoea gone; liver almost normal * (7)
15	S/M. P.		Amoebae and <i>E. hist. cysts</i>	none	—	—	—	"enlarged"		
16	Pte. Mg.	Dysentery in Egypt; much diarrhoea since	<i>E. hist. cysts</i>	99.5	none	none	D.A.H.	4th rib	Above 9th spine	Liver signs disappearing
17	Pte. B.	Dysentery on Peninsula; much diarrhoea since	—	99.5	Back	R. subcostal	Myalgia	4th rib	8th spine	Liver signs and diarrhoea disappeared

* NOTES.

- (1) Left lobe abscess evacuated by aspiration through laparotomy wound.
- (2) Stool examined after emetine had been given.
- (3) Abscess coughed up.
- (4) Diarrhoea disappeared and temperature fell to normal on first course; fever recurred, but subsided on second course; subsequent history not known.
- (5) Patient not examined by us till fourth day of emetine treatment.
- (6) Patient had been in close contact with men from the Peninsula.
- (7) This was an obvious case of acute hepatitis; he was only seen once by one of us, and no record was made of the exact condition or history. He is included for the sake of the blood-count.

has been "suitably diluted" it should give a perfectly clear differential stain in two minutes, and should neither overstain nor precipitate in the counting-chamber for an hour or more.

Name and Rank	White cells	Polymorphs	Condition
I. Pte. R.	16,000 ..	63 per cent ..	Jaundice
II. Rifleman W. ..	15,000 ..	57 ..	Enlarged liver and fever, not affected by emetine, but yielding to quinine
III. Trpr. J.	16,700 ..	31 ..	Enlarged liver with cedema of the legs
IV. Lance-Cpl. B. ..	14,800 ..	57 ..	Post-operative jaundice
V. Pte. W.	19,000 ..	69 ..	Post-dysenteric arthritis
VI. Pte. B.	18,700 ..	67 ..	Fever, not affected by emetine, yielding to quinine
VIA. "	15,600 ..	63 ..	Trench fever (acute)
VII. Pte. H.	16,800 ..	67 ..	Moderate thyroid enlargement
VIII. Sapper D. ..	16,000 ..	39 ..	Considerable thyroid enlargement
IX. Pte. Wm.	16,200 ..	48 ..	

In the first six of these amoebiasis was suspected and the blood count was thought to confirm the diagnosis, but the subsequent course practically negated that diagnosis.

Counts of Two Definite Cases.

	White cells	Polymorphs	Condition
Case 15	16,500 ..	68.5 per cent ..	Hepatitis with fever
Case 1	10,000 ..	67 ..	Abscess with fever
" 1	12,600 ..	69.6 ..	" " "
" 1	13,000 ..	64.4 ..	" " "
" 1	15,500 ..	62.2 ..	Abscess near max. temp.
" 1	18,400 ..	56 ..	On emetine: pericarditis
" 1	10,300 ..	63 ..	Convalescent after aspiration

The percentages of the other cells showed no distinctive feature. It would seem that under present conditions a high percentage is of more value as excluding an uncomplicated amoebic liver affection than a low one as confirming that diagnosis.

Treatment.—We have found Rogers' original method—emetine followed by a full course of ipecac.—gives the best results. We give $\frac{3}{4}$ grain twice a day for six days and then give the traditional decreasing doses of ipecac., beginning with forty-five grains. The first dose is preceded by thirty minims of tinct. opii, and the amount of opium is thereafter so adjusted as to prevent vomiting or purgation and yet avoid constipation. The ipecac. is given in the form of five-grain pills, well coated with salol, as recommended by American authorities, and we have found this a very satisfactory method. Latterly we have continued the morning injections of emetine throughout the course of ipecac. as practised by Captain Coleman in Tigne hospital with, we believe, excellent results. Our experience of emetine-bismuth-iodide has not been very happy. The powder seems to be quite as troublesome to give as the ipecac. pills; it causes as much nausea and vomiting, and needs the same precautions; and the

pills of the same drug, though small, few and comfortable, appear to be inoperative and to pass through unchanged. As a rule the effect of treatment is prompt and complete; if it is not in a definite case of amoebic liver, or particularly if the fever and some of the symptoms subside while shoulder-pain and marked percussion signs persist, the greatest care should be taken to make absolutely certain that no abscess is present. Occasionally a long-standing hepatitis will resolve very slowly, requiring two courses of emetine treatment, Rogers' treatment of abscess by aspiration and the injection of a grain of emetine or thirty grains of quinine into the cavity, has given excellent results in the hands of one of us (R.A.P.H.); it must of course be followed by a complete emetine and ipecac. course to try and rid the intestine of affection.

Our best thanks are due to the medical officers of Tigne and Spinola Hospitals for their kindness in permitting us to examine the cases under their care and publish these notes of them; especially Captains Maclaren, Todd, Coleman and Bateman of Tigne and Captain Pugh of St. Elmo; and to Major Campbell of St. Andrew's hospital for help in the comparison of the results of clinical and X-ray examination.

NOTE ON THE PRESENCE OF MENINGOCOCCI IN THE SKIN PETECHIÆ IN CEREBROSPINAL FEVER.¹

BY LIEUTENANT-COLONEL ROBERT MUIR.

Royal Army Medical Corps (T.F.).

From the 3rd Scottish General Hospital.

THE following observations are recorded as, so far as I have been able to ascertain, the actual presence of meningococci in the skin petechiæ in cerebrospinal fever has not been noted in this country. Since they were made I have found that similar results have been obtained by other observers in France, America, and Germany, and to these further reference is made below. Experience during the war has shown that meningococcus septicæmia is of much more frequent occurrence than was formerly supposed; numerous cases without meningitis have been recorded, and the presence of meningococci has been demonstrated by microscopic examination of blood-films made during life, by several observers. The finding of the organisms in the petechiæ is therefore not surprising, but as will be described, they may occur in large masses, leading to the blocking of the minute vessels and thus to hæmorrhage. It is not at present suggested, however, that petechiæ are always produced in this way; there is also the possibility that they may be the result of toxic action, as is generally supposed. In the two cases which I examined, however, I found the meningococci without any difficulty, and seeing also that a few plugged vessels may easily escape detection, it is likely that the actual presence of the organisms is not infrequent. I should have wished to examine other cases in the same way, but as no further opportunity has occurred, the observations are published, incomplete as they are. The essential facts with regard to the cases examined are the following; it is unnecessary to give details.

Case 1.—G. F., aged 26, a private in the American Army, was admitted from a troopship on September 29, 1918, as a convalescent from influenza. His progress was satisfactory till the morning of October 4, when at 8 a.m. he had an attack of great restlessness; it was found that his temperature was 103·8° F., and that an abundant petechial eruption was present on the trunk and limbs. Rapid heart failure ensued and he died at 10.45 a.m.

At the post-mortem examination there was no trace of meningitis or other lesion in the central nervous system, and no meningococci could be found by culture or by microscopic examination in the brain or spinal cord; films were made from various situations, cerebral and spinal meninges, ventricular fluid, surface of choroid plexuses, etc., all with negative result. A few patches of recent pneumonic consolidation, partly hæmorrhagic, were present in both lungs, especially in the superficial parts. These were single patches, well circumscribed, and were probably the result of blood infection. The spleen was considerably

¹ Communicated to the Pathological Society of Great Britain and Ireland, July 25, 1919.

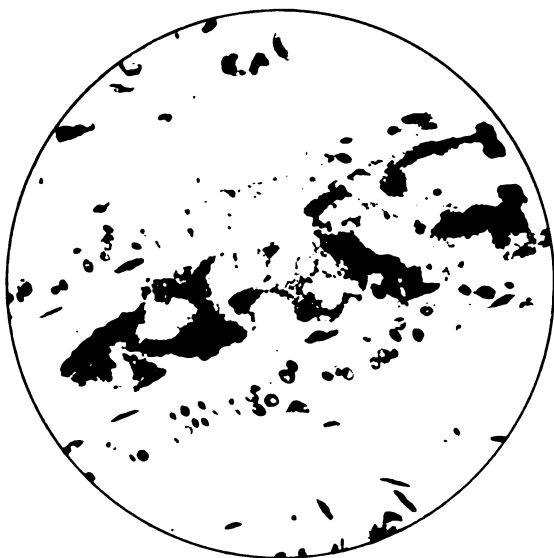


FIG. 1.—Longitudinal section of a small arteriole in cutis, showing masses of meningococci lying in lumen. $\times 750$.

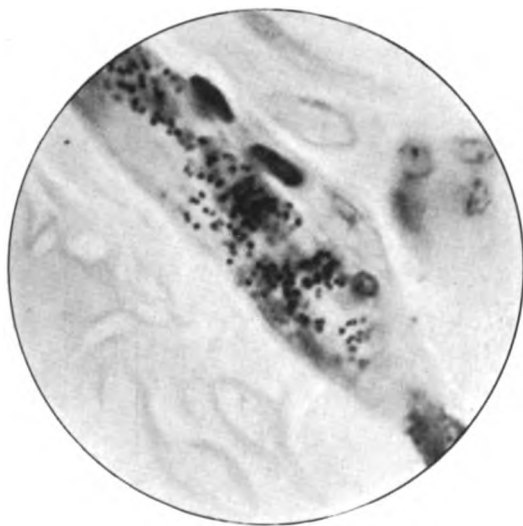


FIG. 2.—Capillary in cutis containing numerous meningococci, the morphological characters of which can be distinguished. $\times 1500$.

Both figures are from sections of a petechial spot in the skin, stained by thionin blue.

To illustrate "Note on the Presence of Meningococci in the Skin Petechiae in Cerebrospinal Fever," by Lieutenant-Colonel ROBERT MUIR, R.A.M.C. (T.F.).

swollen (weight ten ounces), pinkish and rather soft. No other lesion of importance was present. No hæmorrhages in internal organs.

Films made from the petechiæ in the skin showed Gram-negative diplococci in considerable number, most lying free, but some being within leucocytes. Blood cultures made from the blood post mortem gave an impure growth in which Gram-negative diplococci were present, but the meningococcus was not obtained in a pure state. Gram-negative diplococci were found in small numbers in films made from the patches of consolidation in the lungs, and a very few were also found in the spleen, most being in a degenerate condition; but attempts to isolate the meningococcus from these situations were unsuccessful.

Case 2.—W. C., aged 23, a private in the American Army, was admitted from a troopship, convalescent after influenza, on September 29, 1918. He suffered from cough with purulent sputum and occasional epistaxis. At 2 a.m. on October 5, he had an attack of vomiting; at 7.30 a.m. a purpuric eruption was noted on the face and trunk. He sank rapidly, and died at 9.55 a.m. Some twitching of left arm was noted previous to death.

The findings at the post-mortem examination were closely similar to those of previous case. Again the result was negative as regards meningitis and the presence of the meningococcus in the central nervous system. Some patches similar to those described above were present in the lungs, but meningococci could not be detected in them. Gram-negative diplococci along with influenza bacilli and various other organisms were present in the bronchial secretion, but here again the meningococcus could not be isolated.

Films made from a petechia showed numerous Gram-negative diplococci, both inside and outside leucocytes. The meningococcus was cultivated both from a petechia and from the blood taken from a vein in the arm, and was found to be of Type II (Gordon).

I did not see either of these cases during life, and I am indebted to Captain Ernest Fortune, R.A.M.C. (T.) for the clinical facts.

These two cases of acute meningococcus septicæmia were closely similar as regards their course and the lesions present. It is hardly possible to say when the first symptoms occurred, but both patients were in fair health on the evening previous to the morning on which they died. The appearances in the films made from the petechiæ were almost identical and the diplococci were present in considerable number. Although the meningococcus was not isolated in the first case, there can be no doubt that the diplococci found were meningococci. It may also be mentioned that both patients were recovering from influenza and were in the same ward, and that the one case occurred on the day after the other. Unfortunately, sections of a petechia were made in the second case only, but the appearances are very striking. All through the cutis in the hæmorrhagic area the organisms are to be seen in large numbers within the minute blood-vessels, and their morphological characters can be readily recognized. They are present in the minute arterioles and venules and in the capillaries, but they are on the whole most abundant in the site first mentioned. They occur most frequently as a layer on the endothelium, but not infrequently the small vessel is plugged by them (figs. 1 and 2). The

endothelial cells are swollen and sometimes leucocytes are seen adhering to them. A few of the leucocytes contain the organisms, some appearing packed with them, but this occurrence is not common, and the great majority of the cocci form extracellular masses. A few cocci can also be found lying among the extravasated red corpuscles, but these are much scantier than one would have expected from the appearance in the films. There is little or no evidence of inflammatory reaction around the vessels containing the organisms; in fact, leucocytes extravascular in position do not appear more numerous than would be accounted for by the effused blood. The picture is thus one of hæmorrhage associated with, and clearly due to, the collections of meningococci within the vessels.

I find that similar observations have been obtained by other observers. Netter and Salamier (1916) describe two cases of cerebrospinal fever in children, one without meningitis, in which Gram-negative diplococci, presumably meningococci, were found in films made from the purpuric spots. They also refer to a previous observation by Benda who found meningococci amongst the cells around the vessels in sections of petechiæ, and corresponding results have been obtained by Pick, Ghon, and by Babes. Several of these writers note the presence of inflammatory reaction around the vessels involved; this, as has been stated, was absent in the case examined by me, possibly on account of the extreme acuteness of the case. Sharpe also, in the same year, published the finding of meningococci within the capillaries in the purpuric areas; the case was that of a child, and it is to be noted that most of the cases in which positive results have been recorded have occurred in children. Netter and Salamier, along with Wolfram, in another communication describe a case of meningococcus septicæmia without meningitis, in which the diagnosis was made during life by means of films from the purpuric spots. These observers in association with Blanchier in the following year published other cases with positive results, and in one of these they cultivated the meningococcus from the petechiæ. They state the organism obtained differed in its reactions from that usually met with, and suggest that cases with purpura are of different type. In this connexion it is to be noted that the meningococcus obtained by me was of Gordon's Type II, which of course is also associated with mild sub-acute cases. The observations made by those who have obtained positive results show that the meningococcus is not infrequently present in petechiæ, but whether or not it is invariably so can only be determined by much more extensive observations.

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OBSERVATIONS ON THE FORMATION OF "BUDS" BY THE SPIROCHÆTE OF RELAPSING FEVER IN THE LOUSE.

BY LIEUTENANT-COLONEL J. C. KENNEDY,
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THERE is still much to be done towards the elucidation of the life history of *Spirochæte recurrentis* in the body of the louse. The following would appear to be proved and generally accepted:—

(1) The spirochætes after ingestion by the louse very soon disappear from the gut and cannot be found on dissection.

(2) For the first four days thereafter the spirochætes remain invisible and the louse is not infective.

(3) On the fifth to the sixth days the spirochætes are still invisible but the louse is infective.

(4) On the seventh to the eighth days spirochætes appear as slender forms in the louse which is still infective.

(5) From the tenth day onwards adult spirochætes appear in the louse which is now practically non-infective.

(6) The adult (non-virulent) spirochætes usually disappear from the body of the louse by the nineteenth day, but may be found up to twenty-five days.

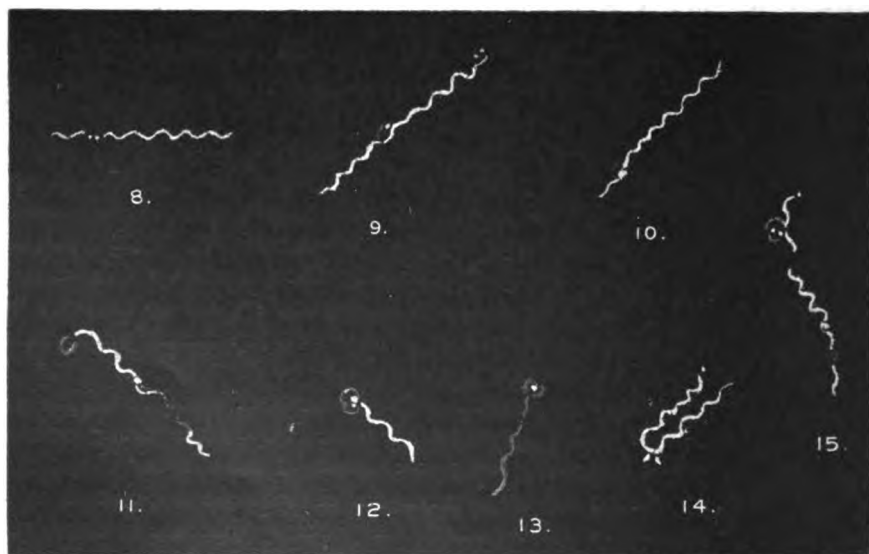
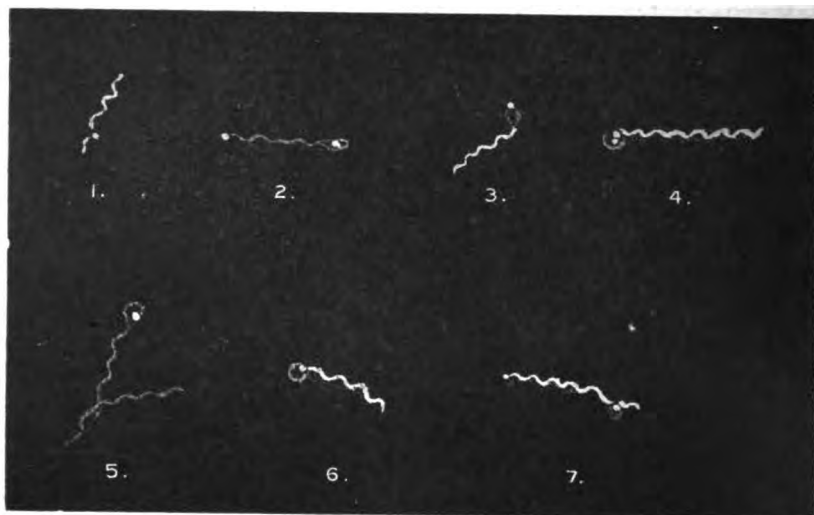
(7) There is hereditary transmission of the virus in the louse as the offspring are infective.

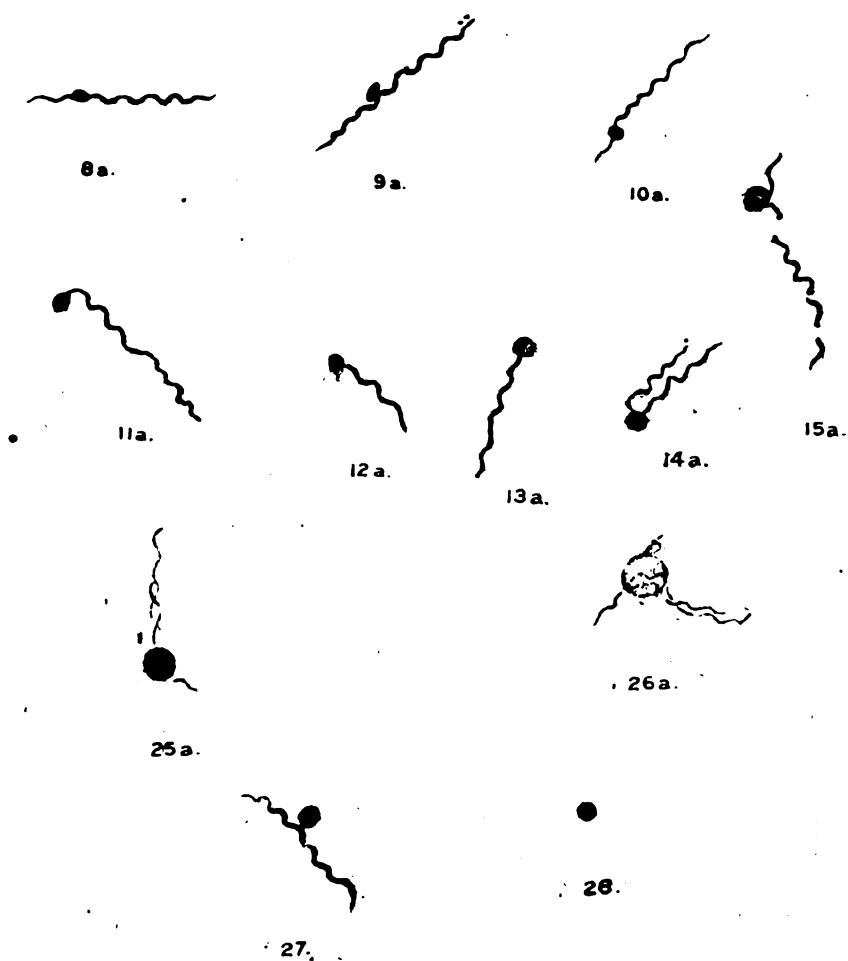
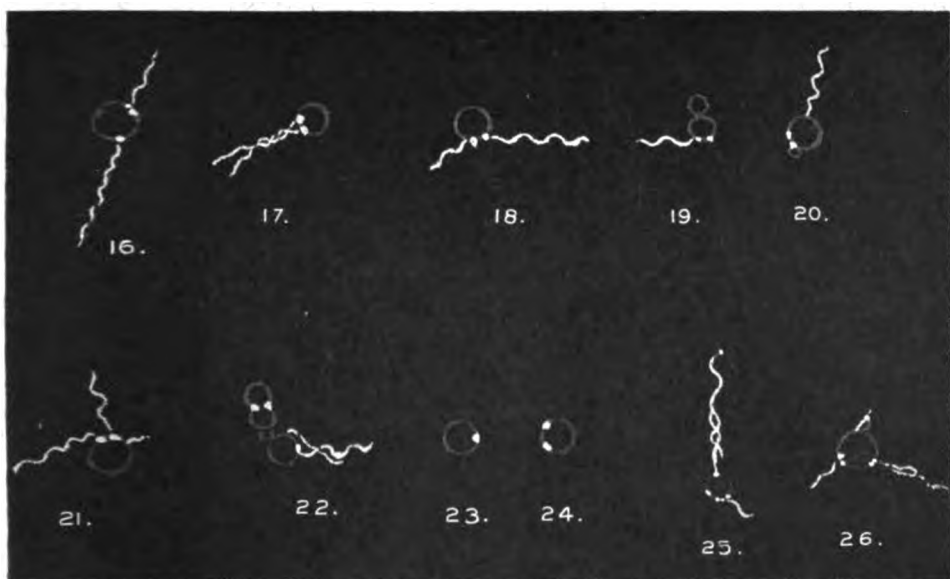
Two stages, therefore, in the life history of the spirochæte in the louse are unknown—first, the stage of invisibility during the first four days and, secondly, the transmission to the offspring.

These gaps in our knowledge will no doubt be filled when we have acquired the means of recognizing and studying the granule phase of spirochætes in its entirety. Meanwhile I am induced to make an observation which so far as I know has not yet been recorded, and which in many respects is very similar to that made by Leishman in the case of *S. Duttoni* in the tick, and because there would appear to be some who do not believe that spirochætes undergo any developmental phase in the body of the louse.

These observations were made on the contents of two lice which were dissected twenty-four and thirty hours, respectively, after being removed from the person of a relapsing fever case who had been ill for about three days. Both lice harboured large numbers of spirochætes, and from the size and number of the spirochætes had probably become infected more than ten days previously.

There were no spirochætes inside the gut but enormous numbers in the cœlomic fluid and round about the posterior end of the gut. The majority were large, collected in clumps and motile but delicate and





granular in appearance. There were also a number of small forms, in one case, particularly at the anterior end of the body cavity, but none were found in the salivary glands. Their presence was ascertained by rapid examination of the wet specimens, which were then fixed in osmic acid or alcohol and stained by Leishman, Giemsa or Heidenhain's stains. The presence of "buds" was realized when examining a slide by dark ground illumination, and on closer examination they were found in several others. After a careful examination by both methods of illumination, there is no doubt in my mind of the spirochætal origin of these "buds."

The originals of the accompanying drawings were made by means of a camera lucida, magnifying about 1,500 diameters, and many of the objects are depicted as they appear both with dark ground and with direct illumination. Those figures with a following the number are from the same objects as those bearing the corresponding number. The "buds" vary in size from $2.2\ \mu$ to $4.5\ \mu$, and their situation in relation to the spirochætes may be terminal, subterminal or lateral. They stain feebly with Leishman or Giemsa stains, but Heidenhain's brings them up better and differentiates one or more deeper staining portions (figs. 12a to 15a, 27). They are not very refractile (dry film), but frequently show a refractile granule (figs. 9, 10, 12, 13). Bodies similar in appearance were found lying free, presumably detached from the spirochæte, and one was found in the preparation made from an ovum, but this may have been accidental (fig. 28).

Large numbers of refractile granules were found in the cœlomic fluid, in the tissues round the gut, and some clumps in the ovaries and ova. It is, of course, impossible to say which were of spirochætal origin.

In one of the specimens from the cœlomic fluid, it was noted that the spirochætes had an affinity for certain cellular elements. These cells were round and cyst-like, $4.8\ \mu$ to $6\ \mu$ in size, with a well defined margin, and staining a faint slaty-blue with Leishman. A number showed one, two or more chromatin granules at the margin (fig. 25a). These granules undoubtedly were spirochætal and were refractile by dark ground illumination (figs. 16 to 26). With Heidenhain's iron hæmatoxylin they stain uniformly a deep black. Similar cells are to be found in non-infected lice but without the granules.

As the relapsing fever season is now practically over, I do not anticipate having much opportunity for further investigation at present.

DESCRIPTION OF DRAWINGS.

- Figs. 1 to 7.—Appearance of spirochætes with granules and "buds" seen with dark ground.
 Figs. 8 to 15.—Ditto. Compare these with figs. 8a to 15a, which are the same spirochætes seen with direct illumination. Stained Heidenhain's iron hæmatoxylin.
 Figs. 16 to 26.—Cellular elements with refractile granules, with and without spirochætes attached. Dark ground.
 Figs. 25a and 26a.—The same as figs. 25 and 26. Leishman's stain.
 Fig. 27.—"Bud" showing differentiation of a deeper staining portion. Compare "buds" 12a, 13a, 14a, and 15a.
 Fig. 28.—? "bud" from crushed ovum.

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Clinical and other Notes.

A NOTE ON THE MICROSCOPIC METHOD FOR TESTING AGGLUTINATION REACTIONS.

By CAPTAIN H. E. ROAF.

Royal Army Medical Corps (T.F.).

From the Department of Pathology, Citadel Military Hospital, Cairo.

WITHIN the last few years the macroscopic method for testing agglutination has become widely used. This method is said to be more delicate than the original microscopic method, by which it is meant that agglutination is obtained with higher dilutions of serum.

The application of the macroscopic method to serum diagnosis of "enterica" in inoculated subjects has led to an erroneous opinion of the value of serum agglutination for diagnostic purposes. If one uses the microscopic method, the fact of inoculation interferes much less with the diagnostic value of the agglutination tests.

In support of the above contention I can quote the following figures of agglutination reactions carried out on fifty-nine cases of patients inoculated by the triple vaccine against *Bacillus typhosus*, *B. paratyphosus* A, and *B. paratyphosus* B.

	Typhoid		Para A		Para B
Negative in a dilution of 1 in 20	45	..	55	..	56
Positive in 1 in 20, but negative in 1 in 50 ..	8	..	4	..	2
Positive in 1 in 50, but negative in 1 in 100..	5	..	0	..	1
Positive in 1 in 100, but negative in 1 in 200..	0	..	0	..	0
Positive in 1 in 200, but negative in 1 in 500..	1*	..	0	..	0

* The single case giving an agglutination of 1 in 200 was probably a genuine case, as earlier examination of the same patient's blood gave an agglutination of 1 in 100.

These figures are widely different from those obtained the preceding year before the introduction of the combined T.A.B. vaccine, when actual isolations by blood culture were more frequent. Agglutinations in a dilution of from 1 in 500 to 1 in 1,000 were common before the introduction of the vaccine.

During the period covered by these results, *B. typhosus* was isolated from the blood in two cases. These gave an agglutination with *B. typhosus* in a dilution of 1 in 500 and 1 in 1,000 respectively.

The technique was as follows: The patient's serum was diluted with saline solution (0.9 per cent NaCl) by means of a pipette and rubber teat, so as to make a 1 in 5 dilution. One volume of this dilution was mixed with three volumes of a killed bacterial emulsion, making a final serum dilution of 1 in 20. A drop of this mixture was placed on a cover slip which was inverted over a vaselined ring cemented to a glass slide. The slide was left at room temperature.

After one hour the hanging drop was observed, and the result recorded. If negative in all three bacterial emulsions, it was entered as negative. If positive in one or more, the serum was diluted further, and mixed with bacterial emulsions so that the final serum dilutions were 1 in 50, 1 in 100, 1 in 200, 1 in 500, 1 in

1,000, etc., and the highest dilution in which agglutination occurred in one hour was recorded.

The superiority for diagnosis of the microscopic method lies in the fact that inoculation does not cause an appreciable increase in agglutination, whilst actual cases show a marked increase in agglutination.

The microscopic method was also used in the diagnosis of dysentery cases. As dysentery bacilli usually disappear from the fæces within the first seven days, many cases forwarded to the base arrived too late to hope for a positive bacteriological isolation of the specific organism. The earliest possible blood and mucus motion was sent promptly to the laboratory, and, if it was negative, an agglutination test was carried out. If the examination of the fæces and of the blood were both negative, a further search for protozoa was frequently made.

The results of the agglutination are given in tabular form, and taking a positive result in 1 in 50 as indicating probable infection, one sees that a quarter of the cases can be shown positive by this method.

In view of the figures given in this note, it seems desirable to give the microscopic method of diagnosis a further trial. The technique is as simple as the macroscopic method, and the results seem clearer of interpretation.

	Shiga	Flexner "Y"
Negative 1 in 20	141	190
Positive in 1 in 20, negative in 1 in 50 ..	39	26
Positive in 1 in 50, negative in 1 in 100 ..	30	12
Positive in 1 in 100, negative in 1 in 200 ..	12	3
Positive in 1 in 200, negative in 1 in 400 ..	8	0
Positive in 1 in 400, negative in 1 in 800 ..	1	0

THE TESTING OF MICRO-ORGANISMS FROM BLOOD AND STOOL CULTURES BY AGGLUTINATING SPECIFIC ANTISERA.

By MAJOR W. BROUGHTON ALCOCK.

Royal Army Medical Corps.

A METHOD of testing the agglutinability of micro-organisms of the enteric group obtained by culture from the blood or stool, by employing low dilutions of specific antisera with a short-time limit, was carried out in a few laboratories on the Continent some fifteen years ago. Bacteriologists of the Royal Army Medical Corps essayed this method, and much valuable work thereon has been carried out by Greig and later workers in the laboratories in India. By this method an early tentative diagnosis was obtained, and much time and media saved. In the busy routine work of a laboratory, and especially when examining cases in the later stages of disease, or in the search for carriers, more colonies can, by such a method, be examined in a given time. Direct sowing into selective sugars of one or more colonies from the plate is adopted to supplement it.

In carrying out this method and in extending it for detecting colonies of the groups of *Bacillus dysenteriae* and other micro-organisms, very satisfactory results were obtained by using the specific antisera in a determined dilution, and giving three minutes' time for the reaction. Specific antisera supplied by the Pasteur or Lister Institute, having a titre when tested microscopically, after two hours at

37° C., of 1 in 3,000, or higher, were employed. Dilutions thereof were prepared as follows: For the enteric and cholera groups, a specific serum for each was prepared, so that its agglutinin strength was fifty times, and for the dysenterica and melitensis groups a hundred times that in the high titre fraction, e.g., high titre of specific serum 1 in 4,000 dilution used, 50 by 1 in 4,000 equals 1 in 80; or 100 by 1 in 4,000 equals 1 in 40.

Original colonies, when isolated from blood, or when isolated from faeces and which showed agglutinability in a dilution of specific serum, proved in almost every instance to belong to the particular group indicated by the agglutination reaction, after the usual fermentation tests were carried out. Very rarely, slow or non-lactose fermenting coliform bacilli were agglutinated in the above dilutions of sera. In the Flexner-Hiss groups there was found an exceptional strain which did not agglutinate in specific animal antisera supplied, but was agglutinated by the patients' sera. In the *B. dysenteriae* Shiga group, all strains isolated were readily agglutinated. Amongst over 1,000 strains of the enteric groups examined, one of *B. paratyphosus* A and one of *B. paratyphosus* B were inagglutinable in a low dilution of its respective animal antiserum. For the *B. Aertrycke* and *B. Gaertner* groups the corresponding antiserum had to be employed. The vibrio Finkler and Prior, and a vibrio parachloerae were not agglutinated in a specific anti-cholera serum.

The short time taken for the test diminished most notably any agglutination of a strain resulting from the presence of co- or hetero-agglutinins in an antiserum. If an emulsion of a micro-organism was tested simultaneously in two agglutinating sera, the one specific for the group to which the micro-organism belonged, and the other for allied groups, agglutination in the antiserum containing the specific agglutinin preceded that in the other antiserum. There was occasionally a variation in agglutinability amongst colonies of the same strain, but it was in almost all only one of slight degree.

An extension of the application of this method may be described. As *B. Morgan* No. 1 colonies on MacConkey's media so closely approximated in appearance, and so frequently accompanied and outnumbered those of *B. dysenteriae* Shiga in the later stages of dysentery due to the latter micro-organism, it was found very helpful to prepare a specific agglutinating sera for *B. Morgan* No. 1, and to test therewith a colony prior to submitting it to the fermentation tests. When working on intestinal infections, one has made the practice of testing one or more suspicious colonies in one or two sugars before employing the broadest test. The fact that occasionally a strain of *B. Morgan* No. 1 does not readily produce gas in glucose peptone water, that motility is masked, and indol production slow, shows how helpful it is to determine this micro-organism early and spare time and media.

Example 1.—From a blood culture, colonies probably belonging to the enteric group are emulsified in a very small bead of saline and then divided into three parts. The three drops are then placed on a slide each under a drop of about half a minim of anti-T, anti-B, and anti-A serum respectively. Each serum and emulsion are brought together, and the slide is repeatedly half turned backwards and forwards, and agglutination is watched for. It most frequently begins very quickly, but in a few rare cases it may be necessary to continue the rolling up to the three minutes' time limit.

Example 2.—From a stool culture one may, from the clinical history and the appearance of the stool, be able to suspect and search for colonies of bacilli belonging to this or that group, and so test them directly in the respective antisera of each group. Such was found the case in 1914 and 1915 in France, but at Malta the patients received from Gallipoli had not infrequently mixed infections and complex clinical symptoms. Suspicious colonies to the number of four or up to eight have been taken and replated on to another plate marked off into sections. This not only ensured for each purity of culture for the test in sugars, etc., but gave sufficient growth for an agglutination test in drops of specific animal antisera of several kinds.

Pending the more complete examination, the tentative classification of a micro-organism obtained by this simple agglutination method is so rapid, so very exceptionally ambiguous or misleading, that the advantages to the clinician, who is seeking the help of the laboratory in making an early diagnosis, to the epidemiologist and to the sanitarian who are seeking helpful indications within as short a lapse of time as possible, have encouraged us in its continued utilization.

In conclusion, I wish to mention Qmr.-Serjt. Dermody for his valuable assistance in carrying out the laboratory work.

SOME EXPERIMENTS UPON THE CONTROL OF FLY-BREEDING AREAS IN CAMPS.

By MAJOR W. F. CORFIELD.

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IN the summer of 1917, while the Division was before Gaza, fly-breeding in old latrine or refuse pits was controlled by sealing such pits, after they had been filled in, with sheets of fine-mesh sacking (hessian), the edges of the hessian being turned vertically downwards for six inches all round and beyond the pit margins.

When the flies reached the surface of the pit they were unable to make their way through the fine meshes of the hessian, and died beneath the seal so formed. If such a seal were taken up after three weeks, by which time all the fly eggs in the pit had hatched out, the ground immediately below the sacking was found to be covered with dead flies.

During 1918 some pits were sealed with ordinary sacking sprinkled with fly deterrent, and the following experiments were undertaken with a view to testing the value of the different fly deterrents then available. The experiments were of such interest that they were continued in order to find the most successful method of sealing latrine or refuse pits.

MULEBBIS PITS.

The first three experimental pits were dug on June 11, 1918, at Mulebbis. Each pit was roughly two feet long by one foot broad, and three feet deep. Human faeces were spread at the bottom of the pits, and broken up each morning for three days, to allow the ready access of flies. On June 14 these pits were filled in and sealed with a single layer of sand-bags, split open, and turned down

beyond the margins of the pits in usual way. The sand-bags over No. 1 pit were then heavily sprinkled with a ten per cent solution of cresol, those over No. 2 pit with crude oil, and those over No. 3 with "C" solution. A layer of about six inches of earth was put over all three pits. Sand-bag sacking alone is useless for sealing pits, as flies readily find their way through the meshes. The soil in which the pits were dug had been recently ploughed; it was somewhat clayey, black soil, but not cotton soil.

On July 18 the three pits were opened with very disappointing results, as the seals had in all cases proved useless. Plenty of empty pupæ cases were found, but practically no dead flies.

WILHELMA PITS.

On July 31 three more pits that had been made as described above were sealed at Wilhelma. The sealing was done as before, but instead of sprinkling, each strip of sand-bag sacking was soaked in the solution, and over each seal a second seal of plain hessian was fixed, some six inches beyond the sand-bag seal all round; the intention being that if flies got through or round the edges of the sand-bag seals, they would be caught by the hessian seal. The earth was dry, hard, black cotton soil.

On August 19 these three pits were opened. Neither seal had been effective; and empty pupæ cases were present under each seal in abundance, with only a few dead flies under the hessian. The pupæ cases were collected in each case almost exclusively at the corners and sides of the pits, showing that for some reason the maggots had burrowed to the side rather than straight up to the surface, or had travelled to the sides as soon as they reached the surface. It appears more probable that the former was the correct explanation.

The maggots, appreciating the presence of the deterrent as they came towards the surface, burrowed away from it, and came up beyond it, in the great majority of cases so far beyond it that the flies easily found their way round both seals.

RED HOUSE WOOD—SERIES I.

On August 23 three pits were made as before, and sealed this time with hessian. The hessian over No. 1 pit was left plain, that over No. 2 was soaked in crude oil, and that over No. 3 in "C" solution. Over each pit was erected a mosquito bivouac net, care being taken to bury the edges so that no flies could escape. On August 29 there were two flies in No. 1 (plain) net, eight in No. 2 (crude oil) net, and none in No. 3 ("C" solution). The next day there were a number of flies in nets Nos. 1 and 2, but still none in No. 3.

On September 3 most of the flies in nets Nos. 1 and 2 had died, and few fresh ones were hatching out. There were still none in No. 3 net. On September 10 a few live flies remained in nets Nos. 1 and 2, but by the 12th all were dead, and no more hatched out.

On September 15 the pits were opened. No. 1 pit (plain hessian): under the hessian were thousands of dead flies, and thousands of pupæ cases, showing that although many flies had escaped round the edges of the hessian, yet it had successfully prevented a large number from doing so. No. 2 pit (hessian soaked in crude oil): probably a number of flies were caught by the hessian, but in

the sticky mass of oil and earth it was impossible to distinguish any large number of flies or pupæ cases.

No. 3 pit (hessian soaked in "C" solution): this pit was most interesting, as no flies at all had escaped from it. Under the hessian only one large fly (*Sarcophaga*) was found, but the earth, particularly that at the edges of the pit, was full of dead maggots.

These had evidently come to the surface to pupate, and been killed there by the "C" solution before being able to do so. The soil was hard caked sand with an admixture of clay.

RED HOUSE WOOD—SERIES II.

On September 2 three additional pits had been started. These were closed on September 4. The first was sealed with plain hessian, but the earth was stamped down as firmly as possible at the edges of the seal. The second was sealed with hessian soaked in "C" solution, and the third was sealed, not with hessian, but with six inches of mud, plastered on in two layers, the second after the first had dried, about twenty-four hours later.

On September 11 there were some flies in pits No. 1 (plain) and No. 2 ("C" solution), and two flies in No. 3 (mud). On September 12 the flies in Nos. 1 and 2 had increased considerably, and in No. 3 there were six flies.

Owing to the attack upon the Turkish positions beginning at dawn on September 19, these pits had to be opened on September 18. Much the same conditions were found as in Red House Wood, Series 1. The hessian had prevented the escape of a large number of flies from pits Nos. 1 and 2, but the "C" solution in pit No. 2 had not killed the maggots to anything like the same extent as in pit No. 3 of Series 1. In pit No. 3 (mud plaster) no more flies had come to the surface after the second day, and innumerable dead flies and pupæ were found in and below the hard mud seal.

SUMMARY AND DEDUCTIONS.

(1) In the summer in Palestine, flies will hatch out within a week. In a latrine or refuse pit to which flies have had access, the large majority of fly eggs will hatch out within a fortnight, but flies will continue to be hatched out for another week. By the end of three weeks all flies will have been hatched out.

(2) That it is worse than useless to seal refuse or latrine pits with sacking soaked or sprinkled with any sort of fly deterrent. The effect of using such deterrent is to drive the maggots to the edges of the sacking, beyond which the flies will readily escape.

(3) That if hessian or similar close-mesh material be used, it must cover an area beyond the original pit. Six inches, the distance usually prescribed is not sufficient. Further experiments are needed to find the necessary distance.

(4) Well worked up mud, six inches thick, plastered over a pit and allowed to dry in layers, and extending well beyond the pit's margin, is as efficient as hessian or similar material.

Experimental pit No. 3 of Series 1, Red House Wood, is of interest in regard to conclusions (2) and (4) above. In this case the hessian dipped in "C" solution had killed all the maggots before they could pupate. The reason appears to have

been that the walls of the pit were composed of hard caked sand and clay through which the maggots could not make their way. The "C" solution had driven them towards the sides of the pit, but they could go no farther, with the result that the "C" solution had killed them.

REPORT ON THE TREATMENT OF *ENTAMOEBA HISTOLYTICA* INFECTIONS.

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AND

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BETWEEN February, 1917, and December, 1918, 383 cases of *Entamoeba histolytica* infection were under treatment in the Medical Division of No. 19 General Hospital, Alexandria. This report contains the results obtained with various courses of ipecacuanha treatment, tried in an endeavour to find which was the most satisfactory.

DIAGNOSIS.

In every case *E. histolytica* was found in the stools of patients. No free amœba was diagnosed as *E. histolytica* unless it possessed all the characteristics of that amœba, and contained red blood corpuscles within its protoplasm, or was accompanied by histolytica cysts.

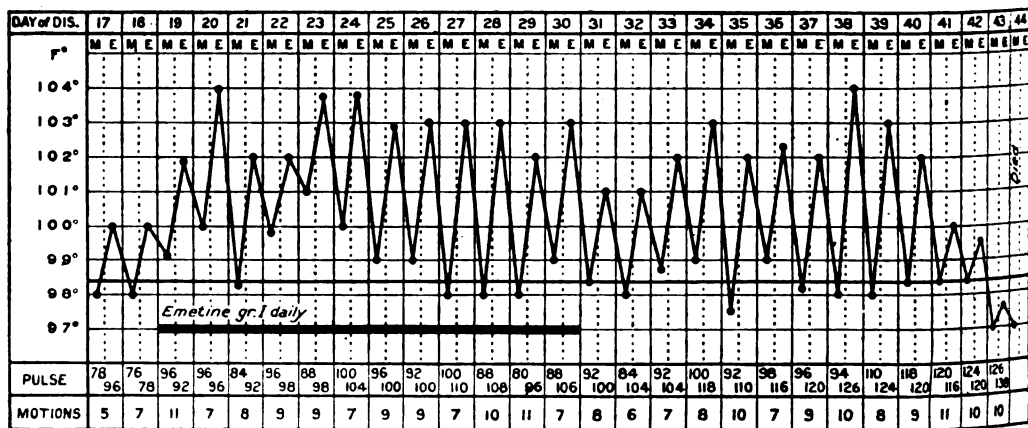


CHART 1.

ACUTE AMŒBIC DYSENTERY.

Among the 388 cases all degrees of severity were found; 144 were admitted with acute symptoms, abdominal pain, tenderness over the colon, and were passing frequent stools containing mucus and blood. On microscopic examination numbers of *E. histolytica* with included red blood corpuscles were found.

Fever in some of those cases was present on admission, but it was rarely above 101° , and rarely persisted for more than three days. In some infections which have been untreated for some time, and where there is a secondary bacillary infection, an evening rise of temperature is not uncommon. In Chart 1, of a case which proved fatal, this septic temperature is well illustrated. During life enormous numbers of *Bacillus coli* were grown from his stools, and *E. histolytica* found microscopically. Post mortem, extensive amœbic ulcerations of the large intestine were found, and on culture *B. coli* was again isolated, but no dysenteric bacillus. A careful examination failed to reveal any cause for the fever except bacillary infection of the ulcerated gut. The importance of this double infection has already been emphasized by Manger [1], Cowan and Miller [2], and others.

"CYST CARRIERS."

In the remaining 239 cases *E. histolytica* was found in its encysted form only. All these cases were examined because they had some form of bowel disorder. Some had amœbic dysentery in the acute form prior to admission, but were then no longer passing mucus and blood. Some gave no history of an acute attack, but had either recurrent or persistent diarrhœa for some time previously. In others again, who had been treated for bacillary dysentery, and from whose stools a positive culture had been obtained, cysts were found when examination was made for clearance. This was exceptional, as all cases of dysentery had several microscopic examinations made to exclude amœbic dysentery, even although a bacillus had been isolated. We had no "healthy carriers," i.e., individuals without present or previous dysenteric history in whose stools *E. histolytica* cysts were found on routine examination.

What pathological condition is present in the bowel of the cyst carrier is very uncertain. Wenyon and O'Connor [3], Rogers [4], Chalmers and Archibald [5], and Cowan and Miller [2], draw attention to the fact that dysenteric ulceration has frequently been found post mortem, where no dysentery was suspected, and suggest that if the stools of these patients had been examined, cysts would probably have been found. These observers and Thompson and Hirst [6] are of opinion that cysts in the stools presuppose ulceration somewhere in the gut. Captain W. Campbell, formerly pathologist to Alexandria District, has told us, however, that he has performed post mortem on cases known to be cyst-carriers who have died of other diseases, and has failed to find any lesion, naked-eye at any rate, in the bowel.

We are of opinion that from the continued presence of cysts without free amœbæ, we may assume that there are present in the lumen, on the walls or in ulcers in the gut free entamœbæ which are in a state of no great activity and may even be non-pathogenic for the particular carrier. While relapses may occur after treatment, no case of ours of this nature has ever relapsed with acute symptoms and free amœbæ.

In such cyst-carriers with recurrent diarrhœa this symptom may be due to an increased susceptibility owing to damage of the bowel by the previous acute dysentery and not to the presence of the entamœbæ which are producing the cysts.

CURE.

Stools of all patients were examined several times during treatment, and four to seven times weekly after treatment was finished. We discharged a patient as "cured" if no relapse occurred for a month after the discontinuation of the specific treatment. It has been pointed out by one of us (R.E.S.) [7], that a relapse may occur at a much longer interval than this, but it is impossible to keep patients, if otherwise fit, under observation for more than a month.

I.—TREATMENT LASTING TWELVE DAYS.

Our earlier cases were all given some form of ipecacuanha for twelve days, the method of treatment advocated at that time. General measures were adopted as well. As long as diarrhœa persisted, a fluid, easily absorbable diet was given so that as little as possible undigested residue would pass into the large intestine. Diet was gradually increased as the patient improved, the stools being constantly observed to see the effect of the extra diet. A small dose of a saline aperient mag. sulphate and sod. sulphate aa $\frac{1}{2}$ drachm, acid sulphuric aromat. 5 minims, aqua ad 3 drachms was given every morning as long as mucus was seen in the motions. Pain was relieved by hot stupes applied to the abdomen, or if severe by morphine hypodermically. Enemata of a pint of 1 in 2,000 copper sulphate or 1 in 2,000 quinine hydrochloride with 1 drachm of liquor adrenalini were sometimes employed, and, in a few cases at least, were thought to lessen the amount of blood passed. Wash-outs of normal saline were very useful to relieve tenesmus. As a rule rectal treatment is unnecessary in amœbic dysentery owing to the rapid improvement with ipecacuanha.

SERIES A.—TWENTY-ONE CASES.

Treatment.—Daily injections of one grain of emetine hydrochloride for twelve days.

Four acute cases were treated. One was cured, but the other three began passing amœbæ again soon after the last injection was given. Of seventeen carriers, eleven were cured.

SERIES B.—TWENTY-FOUR CASES.

Treatment.—Emetine and bismuth iodide three grains daily by mouth for twelve days.

Four acute cases were cured out of a total of ten, and nine carriers out of fourteen. Our results with the treatment were not so good as those recorded by Imrie and Roche [8], Dale [9], and Lillie and Sheppard [10]. Jepps and Meakins [11], and Wandell, Banks, Watson and King [12] also had a large percentage of cures, but the criticism might be made that some of their cases were not examined for a sufficiently long period to exclude the possibility of relapses.

SERIES C.—TWELVE CASES.

Treatment.—Emetine one grain hypodermically and emetine bismuth iodide three grains by mouth, daily for twelve days.

Wenyon and O'Connor [13] met with great success in the treatment of carriers by the concurrent subcutaneous and oral administration of emetine;

Watson, Wemyss and Bentham [15] with a grain of emetine subcutaneously for six days and three grains of double iodide for twelve days cured ninety per cent of their carriers; and Lambert [15] describes good clinical results with this method of treating acute cases.

In our series five acute cases were cured and one relapsed, and all the carriers (six) were cured.

While we were satisfied with the effects of this treatment on the entamœbæ, we found that it was very severe on the patient. Almost all had frequent vomiting and became weak, depressed, lost weight and did not pick up quickly. One patient, previously well except for his dysentery, had persistent tachycardia with palpitation; and after three months spent in hospital and a convalescent home, and an attempt at light duty, he was invalided to England for his cardiac condition.

SERIES D.—SIXTEEN CASES.

Treatment.—Emetine one grain hypodermically and ipecacuanha ten grains in pill form daily for twelve days.

This was better tolerated than the last course, but the curative results were not so good, two out of four acute cases and nine out of twelve carriers being cured.

Table I shows the result of treatment lasting for twelve days.

TABLE I.—TREATMENT LASTING TWELVE DAYS.

Daily treatment	Class of case	Cured	Relapsed	Total
A. Emetine 1 gr. hypodermically	Acute	1	3	4
	Carrier	11	6	17
B. Emetine bismuth iodide 3 gr. by mouth	Acute	4	6	10
	Carrier	9	5	14
C. Emetine 1 gr. hypodermically Emetine bismuth iodide 3 gr. by mouth	Acute	5	1	6
	Carrier	6	0	6
D. Emetine 1 gr. hypodermically Ipecacuanha 10 gr. by mouth	Acute	2	2	4
	Carrier	9	3	12
Total	Acute	12	12	24
	Carrier	35	14	49

II.—SPECIFIC TREATMENT FOR TWENTY-SIX DAYS.

In a few cases that did not quickly respond to emetine injections, good results had been obtained by oral administration of some ipecacuanha preparation for some days after twelve daily injections of emetine. This led us to adopt a much longer course of treatment than any yet advocated, namely the hypodermic injection of one grain of emetine daily for twelve days, followed by oral administration of emetine bismuth iodide for a fortnight.

In Series E (ninety-two cases) the daily dose of the double iodide was two grains, and in Series F (218 cases) three grains. Results are shown in Table II. In referring to the column "Cured (A)," i.e., cases that were examined for a month after treatment was finished, and "Relapses," it will be seen that a larger proportion of cures of acute cases was obtained than with any other method of treatment except that adopted in Series C. It may also be stated that of the thirty-eight that relapsed, the greater number did so as cyst carriers, with few clinical symptoms.

TABLE II.—TREATMENT LASTING TWENTY-SIX DAYS.

Treatment	Class of case	Cured (A)	Cured (B)	Total cured	Relapses	Total
Series E ..	Acute	9	6	15	9	24
(See text) ..	Carrier	48	10	58	10	68
Series F ..	Acute	37	30	67	29	96
(See text) ..	Carrier	58	55	103	19	122
Total {	Acute	46	36	82	38	120
	Carrier	106	65	161	29	190

(A) Cases examined for a month after finish of treatment.

(B) Cases discharged as cured before end of month's control after finish of treatment.

TABLE III.—SUMMARY OF RESULTS AFTER ONE COURSE OF TREATMENT.

Class of case	Cured	Relapses	Total
Acute	94	50	144
Carrier	196	43	239
Total	290	93	383

A very few cases showed no reaction at all to treatment and continued to pass entamœbæ or cysts.

With 101 of our cases we were obliged to depart from our previous standard of "cure." Owing to the urgent need of men in the field, and the necessity of keeping hospital beds for men more acutely ill, those patients were discharged (provided of course that they had not relapsed by that time) as soon as they became fit after treatment was finished. The cases so discharged were those who had the mildest attack and whose symptoms disappeared during the first few days of treatment, so probably the majority, if not all of those cases, would have been in the column "Cured (A)" if they could have been retained for the full month. At any rate we were somewhat gratified at being able to return to duty eighty-two acute cases out of 120 treated with this course of treatment. Several of them who returned later to hospital with other diseases had their stools again examined and were found negative.

TREATMENT OF RELAPSES.

If a case relapsed after an efficient course of treatment it was thought worth while to give a second course after an interval of at least two weeks. About twenty-five per cent of cases so treated were cured. A few cases were given a third course, but the results were very disappointing. Cases that relapsed after two courses of treatment were invalided to England.

EMETINE IN HEPATITIS.

In Egypt it is not an uncommon thing to have patients admitted with pyrexia, an enlarged, painful and tender liver and no other symptoms or signs. A history of previous dysentery or of several attacks of diarrhoea is usually elicited, and examination of the stools may show the presence of *E. histolytica*. In all such cases a provisional diagnosis of amœbic hepatitis was made, and emetine injections begun. As a rule the temperature became normal after three days, and by the end of treatment the enlargement and tenderness of the liver had disappeared, and patients were soon discharged to a convalescent home and had no return of their illness.

MORTALITY.

The following figures for the years 1917 and 1918 are of interest:—

Number of Cases	Bacillary	..	..	..	1,487
	Amœbic or mixed, "A" and "B"	..	..	..	429
	Unclassified	..	..	..	446
	Total	..	..	..	2,312
Deaths	Bacillary	..	..	..	10
	Amœbic	..	..	..	8

One of the deaths from bacillary dysentery was accelerated by, if not due to, concurrent active tuberculosis of the lung.

One of the deaths from amœbic dysentery was due to perforation and acute peritonitis, one was complicated by tropical abscess, one (whose temperature chart has already been referred to) had a *coli* infection as well, and three were mixed amœbic and bacillary dysentery.

CONCLUSIONS.

(1) We should recommend acute cases to be treated with one grain of emetine daily for twelve days, followed by three grains of emetine and bismuth iodide for fourteen days.

(2) If the condition is very severe when treatment is first begun, and may probably prove fatal if not rapidly brought under control, we should recommend an intensive course of treatment of one grain of emetine hypodermically daily in the morning and two or three grains of emetine bismuth iodide at night. The patient should be carefully watched for any untoward effect of treatment.

(3) Acute cases which relapse with symptoms of dysentery might also be treated with the last mentioned course.

(4) We should recommend carriers to be treated by the method stated in (1).

(3) Carriers which relapse after treatment should be discharged if they have no symptoms. They should be informed that they are in no danger themselves,

TABLE IV.

BRITISH TROOPS									
	1916 July 30— December 31	1917	1918	1919 January 1— March 31	Grand total July 30, 1916— March 31, 1919		Egyptian soldiers	British	Egyptians
	No. 955	No. 3,131	No. 3,037	No. 400	No. 7,533	No. 202	1918 to March, 1919	Average 1916—1919	Average 1918 to March, 1919
Total cases .. .. .	..	..	..	..	..	..	..	..	..
Negative	382	1,322	1,451	168	3,323	85	85	44.2	42
Blood and mucus	298	1,223	968	146	2,635	70	70	35	35
<i>Entameba histolytica</i> (with red cells) ..	18	49	116	41	214	11	11	3	5.5
" " (cysts only) ..	44	117	147	35	343	0	0	4.5	0
<i>Entameba coli</i>	147	304	360	36	787	5	5	10.3	2.2
<i>Lambia (giardia) intestinalis</i> ..	120	270	226	31	647	2	2	8.4	1
<i>Tetramitus (chilomastix) mesnili</i> ..	88	118	123	5	384	0	0	4.3	0
<i>Trichomonus hominis</i>	57	102	98	22	279	4	4	3.7	2
<i>Entameba nana</i>	17	138	40	4	199	1	1	2.6	0.5
" (undiagnosed)	89	83	61	7	190	1	1	2.5	0.5
<i>Waskia intestinalis</i>	—	1	—	—	1	0	0	—	—
<i>Coccidium isospora</i> (? sp.) ..	6	3	5	—	14	0	0	0.2	—
"Iodine" cysts	5	21	19	6	51	2	2	0.6	1
Worms:—									
<i>Trichocephalus dispar</i>	18	27	20	3	68	0	0	0.9	0
<i>Ascaris lumbricoides</i>	2	8	17	3	30	28	28	0.4	14
<i>Ankylostomum duodenale</i>	1	—	11	—	16	24	24	0.2	12
<i>Oxyuris vermicularis</i>	—	2	—	—	2	0	0	0.02	0
<i>Bilharzia hematobium</i>	—	2	2	—	4	21	21	0.05	10.5
<i>Tenia saginata</i>	—	1	3	1	5	1	1	0.07	0.5
<i>Tenia nana</i>	—	—	—	4	4	0	0	0.05	0
Total stools examined	3,941	11,775	9,617	468	25,816	202	202	"	"

but are a danger to others. An entry should be made in their pay-books. They should not handle food, and should be instructed about the spread of dysentery from fæces. In the event of the patient subsequently reporting sick, the medical officer could see by the pay-book that the patient was a dysentery carrier, and would thus be on his guard against liver abscess or any other sequelæ of dysentery. We may be too optimistic, but we believe that the number of such sequelæ in carriers would be very small.

In conclusion, we should like to thank Lieutenant-Colonel G. Scott, C.M.G., the officer-in-command of the hospital for over three years, for much valuable advice which he was able to give as a result of his wide experience of diseases in the tropics; and to Colonel J. Cowan we shall always be indebted for the help he gave us both while he preceded one of the writers as officer-in-charge of the medical division, and later when he was Consulting Physician, E.E.F.; and, lastly, we may say that but for the industry of our laboratory attendant, Cpl. J. Young, R.A.M.C., we should have had great difficulty in keeping the records necessary to write this report.

APPENDIX.

The microscopic findings in 7,725 cases of intestinal disease in Egypt, by R. E. Savage.

In Table IV the results of the examination of 25,816 stools of British troops and 202 Egyptians are shown.

The average findings were fairly constant, but in 1918 there was a higher proportion of amœbic dysentery both acute and carriers. During the three months, January 1 to March 31, 1919, this increase seems still further marked.

During the first three months of the year the proportion of amœbic dysentery cases was always large as compared with the other months, and it seems as though there is a seasonal incidence for those months in Egypt, or at any rate the districts from which we had cases.

In the table below the average findings of *E. histolytica* for the months January, February, and March are compared with those for the whole year.

TABLE V.

			January	February	March	Average for year
1916.	August to December	..	—	—	—	6·5
1917.	.. .. .	..	19·1	17·5	10·2	5·3
1918.	.. .. .	..	16·9	17·9	13·8	8·5
1919.	January to March	..	16·5	26·4	10·4	—

In the last two columns of Table IV the average findings in British and Egyptian troops are compared. While the British troops were more infected with protozoa, the Egyptians showed a much higher percentage of worms.

The sixteen cases of ankylostomiasis in British troops were all cured with sixty grains of thymol. We found that a smaller dose was not effective. A dose of calomel was given at night, and a brisk saline aperient in the morning at 6.

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At 8 a.m. thirty grains of thymol in capsules was given, and this dose was repeated at 9 a.m. At noon a second saline aperient was given. The patients were kept in bed on low diet during the day of treatment.

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Report.

REPORT OF A COMMITTEE OF INQUIRY REGARDING THE PREVALENCE OF PELLAGRA AMONG TURKISH PRISONERS OF WAR.

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Graph 4. Pellagra Incidence, per mille by camps.

Chart 5. Pellagra Incidence, Progressive Totals.

Chart 6. Pellagra Incidence, Relation to Dietetic Values.

Graph 7. Pellagra Ætiology, Biological Value of Protein.

Graph 8. Pellagra Outbreak, Biological Value of Protein.

Chart 9. Partial Metabolism Experiment.

THE TERMS OF REFERENCE TO THE
COMMITTEE ARE :—

(1) To investigate whether the disease from which the Prisoners of War are suffering is true pellagra.

(2) To investigate whether the Prisoners of War were generally infected prior or subsequent to capture.

(3) To investigate whether the disease is increasing, and if so :—

THE COMMITTEE'S CONCLUSIONS ARE :—

(1) That it is true pellagra.

(2) That the cases were generally pellagrous prior to capture. The great majority of cases systematically questioned stated that they had similar symptoms before capture, while among the Turkish prisoners examined shortly after capture many were found suffering from the developed disease—e.g., 18 per cent. of one group of 1,300 seen on arrival direct from the front.

(3) It is impossible now to determine to what extent the increase in hospital admissions is due to :—

(i) Medical Officers learning to diagnose pellagra, of which so few have previously seen a case.

(ii) Relapses giving multiple admissions for single cases.

(iii) Development of cases hitherto latent. But there has been a marked increase in admissions from the Labour Camp at Kantara in its first four months during which factors (i) and (ii) were not then in operation.

(a) By infection from case to case.

(b) By infection due to location, or local conditions.

(c) By conditions due to diet.

(d) By any other general conditions.

(a) There is no evidence of case-to-case infection.

(b) There is no evidence of an infection due to location or local conditions; nor of the development of this disease being due to location or local conditions.

(c) That, judged by existing standards, the food issued to both non-labour and labour prisoners provided an ample margin over the requirements of healthy men, and gave a suitable balance of proximate food principles.

But that the biological value of protein fell below the amount which the researches of this Committee indicate as a new standard minimum for the prevention of pellagra. It cannot be determined by any available statistics what proportion of pellagra is due respectively to this deficiency or to the far greater deficiency which existed in the diet of these prisoners before capture.

(d) That any increase in the disease has not been due to other general conditions than those unavoidable for prisoners in monotonous confinement in an alien, hot and arid country, with no stimulus to check the inevitable decline in their physiological resistance.

(4) To investigate the ætiology of the disease in relation to :—

- (a) Bacteria.
- (b) Protozoa.
- (c) Blood conditions.
- (d) Pathology.
- (e) Food.

(4) After thorough investigation by the various workers whose reports are attached, no evidence as to the ætiology of the disease has been found in relation to :—

- (a) Bacteria.
- (b) Protozoa.
- (c) Blood conditions.
- (d) Pathology.
- (e) With regard to food, a careful study of all available information reveals so constant an association between the biological protein value of diet and the occurrence of pellagra, that the Committee considers that lack of sufficient biological value of protein stands in ætiological relation to pellagra, certainly as an exciting factor and possibly as the determining factor. The deficiency in biological value of protein may be :—

- (a) Absolute, as determined by the standard of normal persons, or
- (b) Relative, as determined by individualistic correlation between food assimilation and energy expenditure, and thus profoundly modified by ill-health and idiosyncrasy.

Light has been thrown upon certain phases of this correlation by the results of the biochemical research recorded in the attached report on the work of that section.

(5) Interim recommendations.

(5) Interim recommendations have been made regarding :—

- (a) Improvement of diets.
- (b) The inadvisability of employing Turkish prisoners of war as labourers.

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(6) Final report.

(6) Attached is our final report comprising :—

- (a) A brief account of the course and scope of the investigation.
- (b) A presentation and discussion of the facts upon which the foregoing conclusions are based.
- (c) A summary of the conclusions drawn by the various collaborators.
- (d) Appendices embodying the work and findings of the collaborators in each of the following sections
 - (1) Clinical.
 - (2) Statistical.
 - (3) Bromatological.
 - (4) Biochemical.
 - (5) Pathological.
 - (6) Bacteriological.
 - (7) Protozoological.
 - (8) Hæmatological.

EPITOME OF COURSE AND SCOPE OF THE INQUIRY.¹

The Committee appointed on October 6, 1918, by D.M.S., Egyptian Expeditionary Force, assembled at Kantara on October 7 to consider its Terms of Reference, and establish touch with the personnel concerned. Plans were formulated for determination of local incidence, study of local conditions, and the earliest commencement of research.

STAGE I.

It was stated that the relative incidence of pellagra on prisoners of war had been :—

- (a) Severe in East Kantara Labour Camp since June, 1918.
- (b) Less severe in Kantara Non-Labour Camps, and it was therefore hoped that establishment of any important differences in the otherwise generally similar conditions obtained in Kantara non-labour and labour camps might prove the first steps towards discovery of the cause of pellagra.

Consequently the following investigations were carried out :—

(a) *Incidence on Fresh Captures.*

Of 1,300 prisoners of war arrived at Kantara fresh from the Front on the preceding night, 236 (or eighteen per cent) were found by one of us (F.D.B.) to be suffering from obvious pellagra, thus initially establishing not only the fact but the degree of their affection prior to capture.

¹ Statistical tables, analytical figures and other detailed data are embodied in the appropriate appendices.

(b) *Inspection of all Prisoners of War Camps.*

This was carried out with the utmost thoroughness, but hygienic conditions in general were so good, and the defects pointed out were so promptly remedied, that particulars are only called for in the case of the East Kantara Labour Camp, which figures so largely in this investigation that the following detailed notes are herein embodied instead of forming an Appendix.

Report on Hygienic Conditions at East Kantara Labour Camp.

(1) The *Site* is a previously unoccupied area on a breezy elevation fringing the Desert East of the Suez Canal, which at some 2½ miles distance lies between it and the mosquito-breeding areas of Lake Manzala. The soil consists of clean, dry, and well-drained sand with sub-soil water (salt) at a depth of several feet. No biting insects were seen, or complained of in the camp.

(2) The *Accommodation* afforded was temporarily slightly deficient; owing to the recent arrival at Kantara of several thousand prisoners, each bell-tent had seventeen occupants instead of the normal fifteen. The tents were clean and well spaced, their flies were brailed up daily, and their sites were shifted periodically.

(3) The *Water Supply* was drawn from the Sweet-water Canal (Nile water), filtered, chlorinated, and piped to the camp.

Study of the weekly bacterioscopic examinations shows that the water has been exceptionally pure. During 1918 "Flaginac" *B. coli* has never been found in less than five cubic centimetres and once only in less than ten cubic centimetres. Since pellagra commenced to increase in May last, the total bacterial count has only averaged sixty-four organisms per cubic centimetre.

As some prisoners employed at the Supply Depot had been observed to disregard orders not to drink from the stand-post providing unfiltered water for road-watering, a warning notice in various languages had been put up, and a guard had been posted, pending early provision of a drinking-water stand-post there.

Analyses of Nile water were obtained to determine the colloidal silicon and aluminium in relation to one theory of the etiology of pellagra—which they were found not to support.

(4) The *Food* was inspected in bulk at the Supply Depot, and in detail at two camps where the receipts were checked by one of us (P.S.L.), samples of each article being taken then and there for analysis.

Issues were found to coincide with scale in G.R.O. 3619 (*vide* p. 61) except that a shortage of fresh vegetables was balanced by an over-issue of onions.

Concrete-floored, covered *kitchens* were provided with brick ovens, covered refuse bins and grease-trapped, covered soakage-pits. The kitchen utensils were found scrupulously clean. Few flies were seen here—or elsewhere in this camp.

The *Meals* prepared by trained prisoners of war cooks, were repeatedly sampled and found to be palatable and thoroughly cooked, while the distribution arrangements were most satisfactory.

The *Bread* ration was also traced to its source, and the ingredients at the Port Said Military Bakery were found to be of good quality. As the addition of 10 per cent millet produced a loaf difficult to aerate and bake, the use of millet was discontinued, and a more digestible loaf resulted.

The rations of *Camel meat* were traced to their source; sampled there; analysed; and found to be deficient in fat. This supply, which had never afforded a large proportion of the meat issue, was discontinued promptly upon representations being made.

In an excellent *Canteen* in the compound the men spent practically all their wages (4d. to 8d. a day) on a variety of food provided at cheap rates—fish, cheese, dates, cakes, biscuits, tinned articles, halawa, etc., etc.

Of fifty men questioned in detail, singly and collectively, through their own interpreters:—

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All said that they had no shortage to complain of save that of tobacco; that they would like a variety of fresh vegetables in lieu of rice, of which they were tired; that they were far better fed than before capture, when their rations—especially during the past summer—had been always scanty and often quite inadequate.

As compared with their food at home before enlistment:—

One said that his present diet was not as plentiful; sixteen said that, save as regards variety, it was as good; the remainder said that their present diet was better, both as regards quantity and variety.

The bread, dates, cheese, sugar and half the onions were issued to the men individually and eaten during the day; the balance was bulked and made into a stew for issue at night. As this afforded a somewhat unequal distribution of the day's food, the men were questioned as to whether they would wish a division so as to give them a cooked meal at midday. Only two of the fifty desired this change; the remainder said that the present arrangement was made in accordance with their customs and that they desired its continuance.

(5) *Conservancy* was carried out by permanently employed prisoners of war under the supervision of trained British personnel of a Sanitary Section.

The *Latrines* were provided with well-lidded buckets on concrete floors kept perfectly clean by frequent flushing with cresol. They were practically free from flies. The bucket contents, after liquid had been poured off through lidded funnels into covered soak-pits, were carried direct to the incinerator and burnt with the minimum of exposure to flies. Post-defecation ablution was carried out over the buckets, without spillage, and the small tins for this purpose were immersed in a tub of cresol solution after being used.

The *Urinals* consisted of vertical corrugated-iron sheets, from which urine fell into concrete runnels in the latrine floors and flowed on into covered soakage-pits.

The *Ablution sullage*, after passage through covered chambers fitted with baffle-plates for removal of grease, was disposed of in open soakage runnels in three sections, each section being filled on one day and left for two days for complete drying and removal of the deposited film.

The *Incinerators* comprised a series of raised iron troughs on which all the combustible camp refuse was burnt, the faeces being mixed with, and then covered by, extra tiben (chopped straw) provided for the purpose. Only two or three musca pupa cases were found on prolonged search in the piled and well-burnt ashes.

(6) *Personal cleanliness* was fully provided for and well maintained. Ablution and laundry benches were adequate and clean; floors were paved, water was piped; and ample soap was available. Delousing was carried out at Ludd and repeated at Kantara. The methods of delousing and cresol bathing, which were inspected, were so thorough that only two men were found lousy among 250 examined on arrival from the front, and none were found among a batch of men examined at the labour camp. The men washed themselves daily and their clothes weekly.

(7) The *Conditions of labour* were considered in detail and repeatedly watched. They were in no way exacting, nor was any witnessed labour more than would be classed as moderate.

(a) The men on *piece-work* usually completed their tasks within six hours. The pulse-rates of 100 men taken immediately on their return to camp at 12.30 after the heaviest labour observed, i.e., shifting railway metals—showed that in the ten per cent whose pulse-rate was over 100, it became normal after fifteen minutes' rest, save in the case of two men who were found to have slight fever.

(Note.—These men object to going sick lest they be admitted to hospital and lose their working pay; a fact which in itself indicates their views on the degree of labour they perform.)

(b) The men on *time-work* were employed in two eight and a half hour shifts a day, and were given a midday rest of two hours in shelters built to provide shade. Their

work, as observed, consisted largely of such light tasks as sorting onions, packing supplies or sweeping.

The most exacting work they were observed to perform was that seen by one of us (F.D.B.) in July, when they were employed in carrying stone from barges to the road-makers. The labour then performed may be estimated at about 80,000 kilo-gramme-metres, or two-thirds of the Egyptian standard of 120,000 kilo-gramme-metres for convicts on hard labour. They were not being pressed while under observation, being allowed, when carrying a load, to take their own time and to sit down to rest at intervals.

It was noted that some wore on their heads only a woollen "cap-comforter." While this did not appear to provide suitable protection against the sun, it is a head-dress such as they prefer and affords as much protection as the caps to which they are accustomed. The others wore modified puggrees, extended to form cervical pads.

(8) The *health* of these labour prisoners of war appeared to be good. They looked hale, and the hospital admissions for the preceding week amounted to only three per cent, in spite of the sick-rate having doubled itself in the previous three days owing to an outbreak regarded as influenza which was then prevalent.

In a three years' experience of camp inspection in this theatre of war, no camp had been seen to attain a more uniform excellence of general hygiene, and the details are recorded in full as the basis of the Committee's conclusion that the cause of pellagra was not to be sought in defective camp sanitation—a consideration which was not modified by inspection of prisoners of war camps elsewhere.

Clinical Investigation and Research.

Meanwhile 100 cases, representing all degrees of pellagra among newly captured prisoners, were carefully selected and transferred to Cairo, for detailed clinical study. They were accompanied by two of their own M.O.s to act as interpreters.

By the cordial co-operation of the A.D.M.S., F. in E., and the O.C. No. 2 Prisoner of War Hospital, Abbassia, these cases concentrated in two wards. A small biochemical laboratory had been rapidly fitted up; facilities were provided for pathological research; and provision was made for the conveyance of *materies morbi* to the fully-equipped laboratories of the Kasr el Aini Medical School, full use of which had been placed at our disposal by the kindness of its Director. In addition, the valuable co-operation of the Professors of that school and the officials of the Egyptian Public Health Department had been willingly promised.

Statistical Data.

Another M.O. of the Turkish Army remained at Kantara to collect from prisoners of war information for entry in the "Endemicity Return" compiled to afford a broad basis for conclusions as to the existence and distribution of pellagra in areas where the Turkish Army was enlisted and had served; information as to when and where their first pellagrous symptoms appeared; and the intervals (subsequently checked by reference to the Central Bureau Prisoners of War) elapsing between capture and the onset of initial signs of this disease.

To ascertain accurately the extent and course of this outbreak of pellagra, arrangements were made, by the co-operation of the Inspector Prisoners of War and the A.D.sM.S. concerned, for returns of pellagra cases and ration strengths to be sent direct to the Committee. The first of these returns was retrospective

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as from September 1, 1918, thus carrying on most valuable work done in connexion with pellagra by Lieutenant-Colonel Vickerman and Captains Roaf and Paton at No. 2 Prisoners of War Hospital, where the disease had been recognized, recorded and investigated since its first appearance in November, 1916.

Conclusions.

- (1) That true pellagra existed among prisoners of war when captured.
- (2) That the general hygienic conditions at prisoners of war camps at Kantara are so satisfactory that further search for the cause of pellagra would be more profitably pursued along other lines—especially those of clinical research and the study of diets.

STAGE II.

The Committee having had placed at its disposal the services of recognized experts for all branches of research, and the workers having assembled, a round-table conference was held at which the problems were fully discussed and definite spheres of work allotted. Organization provided for the maintenance of close co-ordination between all Sections, but especially between the laboratory investigators and the clinicians supplying material for examination from selected and controlled cases.

The following summary presents the main features of the work of all sections, with special relation to the Terms of Reference, leaving other details to be dealt with in their appropriate appendices, which embody full particulars of the work and findings of each section.

Clinical Section.

An unprecedented range and concentration of clinical material was available—comprising initially the 100 fresh captures brought from Kantara; later, advanced cases drawn from all sources; and, finally, examination of pellagrins in Khanka Asylum, and Kasr el Aini Civil Hospital, and recovered cases among the Armenian refugees. All varieties of pellagra were thus obtained—acute, chronic, quiescent, slight, advanced and recovered—and clinical data regarding their symptoms and physical signs were tabulated from specially printed case-sheets.

While laboratory work in general centred around the clinical section, that association was especially close as regards biochemical research, and the clinicians also contributed to the study of dietetics. For the sake of clarity, these borderland contributions appear in the biochemical and dietetic summaries. The large balance of clinical work, being of a technical nature is recorded in Appendix I.

The increasing opportunities afforded as this ward work drew to a close were utilized in an endeavour to estimate the influence of the diagnostic factor on statistical records. That influence was found to be so great as to cause doubt as to whether any reliable opinion as to relative incidences of pellagra could be based on any statistical data. Extremely few medical officers had ever seen a case of pellagra until they met the disease for the first time among prisoners of war. Consequently the many newly established prisoners of war hospitals were apt to submit "nil" pellagra returns until such time as typical cases were recognized from text-book descriptions. Subsequently, the capacity of individual M.O.s to diagnose cases at an increasingly early stage of the disease tended to produce statistics showing a fictitious rise in pellagra incidence. Further,

disparities arose through variations in practice as regards the stage at which cases were admitted for hospital treatment, and thus figured in returns. In the labour camps, e.g., cases of pellagra having work to perform had necessarily to be admitted to hospital at a far earlier stage than cases in non-labour camps; in certain non-labour camps considerable numbers of definite pellagrins were maintained as out-patients, by dietetic additions preventing their becoming hospital cases. They were on the borderland from which the extra stress of labour, had they been in labour camps, would have driven them forthwith to hospital—to swell the percentage of pellagra as estimated solely by hospital admissions.

It is important that these aspects should be considered in any attempt to draw conclusions as to actual and relative incidences from statistical tables of different camps, or different periods at any one camp, or outbreaks elsewhere. Many striking points regarding the marked effect of moderate labour on, and rapid recovery of, these borderland cases were brought out by a study of diagnostic practice at East Kantara camp where all workers were examined fortnightly. Careful records show that the usual sequence of fortnightly entries is as follows:—

- (1) Diagnosis doubtful and only to be suspected by the experienced observer
- (3) Diagnosis definite, but the man strong, healthy-looking, and reluctant to go sick.
- (4) Malnutrition apparent; diarrhoea occurring; man unfit for labour. Admission to hospital necessary.

In consequence of this established sequence, cases have latterly been admitted to hospital at the second stage, but the recovery on cessation of work, during the few days that may elapse before evacuation, is so rapid that the cases can with difficulty be diagnosed on reaching hospitals farther down the lines of communication. Yet the accuracy of diagnosis has been repeatedly confirmed (F.D.B.)

The main *conclusions* bearing upon the Terms of Reference are:—

- (1) That the Ottoman prisoners of war are suffering from true pellagra.
- (2) That they were generally infected prior to capture.
- (3) That the deaths of pellagrins are not primarily due to pellagra, but to intercurrent diseases.
- (4) That the disease causes profound disturbance of digestion and nutrition.
- (5) That the German prisoners of war have not suffered from pellagra.

Biochemical Section.

In close association with the clinicians, the efficiency of digestion of fifty-eight prisoners of war was estimated throughout—firstly in hospital patients and later in camp groups of (a) pellagrins and (b) non-pellagrins. This latter investigation was carried out for five days on groups of five men each, lodged and cooked for separately, and having their total excreta—together with the unconsumed rations—collected, by special attendants, for weighing and analysis.

Observations were made on some aspects of the nitrogenous metabolism of 787 prisoners of war—labour and non-labour, healthy and pellagrous, in camp and hospital—from assimilation to renal excretion.

The results showed that, as compared with healthy men, the pellagrin suffers from:—

- (a) Loss of appetite.

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(b) Deficiency of gastric acid, and hence from disorder of the whole sequence of digestion and assimilation, leading to a consequent triple loss of protein thus:—

- (i) Some is not brought into assimilable form.
- (ii) Some is destroyed by bacterial putrefaction.
- (iii) Some is removed by diarrhoea before absorption can occur.

Conclusions.

(1) That the total loss of protein required for the body upkeep is so great as to exercise a profound effect upon the development, and possibly upon the production, of pellagra.

(2) That this loss of the essential protein constituents of food is especially important in that it may convert a diet of adequate protein for normal persons into an inadequate diet for pellagrins.

Pathological Section.

At Cairo and Kantara, autopsies were performed with the double object of ascertaining the causes of death for comparison as between pellagrous and non-pellagrous cases, and of obtaining material for laboratory examination which it was hoped might elucidate the pathology, and possibly the cause, of pellagra.

The numbers of autopsies and principal causes of death were:—

	Pneumonia	Dysentery	Phthisis	Malaria	Total
118 unselected cases	.. 60 per cent	.. 11 per cent	.. 12 per cent	.. 8 per cent	.. 91 per cent
60 pellagrous "	.. 62 "	.. 16 "	.. 7 "	.. 5 "	.. 91 "

Of the whole series of 178 cases, there were only two in which pellagra could possibly be regarded as the determining cause of death, but neither in morbid material from these nor other cases was any definite positive result obtained by careful examination.

The unhealthy conditions under which these prisoners had lived prior to capture is indicated not only by the large proportion of deaths due to phthisis and dysentery, but further by the fact that lesions of those diseases were found respectively at seventeen per cent and sixty-one per cent of the total autopsies.

Conclusions.

(1) That pellagra, as a primary or immediate cause of death, played an insignificant part in the series of cases examined.

(2) That, as a contributory cause, its influence was shared by other debilitating diseases, of which chronic dysentery was even more prevalent.

Bacteriological Section.

The valuable work of No. 2 Prisoners of War Hospital, Cairo, was continued, and from pellagrous patients at all stages a careful examination was made of the fæces of 100, the blood of 50, the cerebrospinal fluid and urines of 11, in addition to many examinations of post-mortem material.

Investigations of similar nature were conducted at Kantara.

Conclusions.

(1) There is no evidence of the presence of any bacterial infection standing in ætiological relation to pellagra.

(2) There is evidence of marked prevalence of co-existent dysentery in pellagrous patients.

Protozoological Section.

From prisoners of war at Cairo and Kantara suffering from pellagra at all stages, a careful examination was made of the fæces of 222, the blood of 50, and the cerebrospinal fluid and urine of 11.

Conclusions.

- (1) There is no evidence of infection by any protozoal, spirochætal, or ultra-microscopic organism standing in ætiological relation to pellagra.
- (2) Putrefactive diarrhœa in nearly all cases was associated with, and accentuated by, the presence of intestinal worms and flagellates.
- (3) Malarial infections were present in 16·6 per cent of cases examined.

Hæmatological Section.

The bloods of 100 selected patients were examined.

Conclusions.

- (1) There is evidence that this disease is not of a protozoological nature.
- (2) Chlorotic anæmia is present in pellagra patients.

Statistical Section.

Since No. 2 Prisoners of War Hospital ceased to be the sole recipient of prisoner patients, the rapid formation of new hospitals for a prisoner population in process of distribution through camps of fluctuating strength has greatly increased the difficulty of collecting accurate data. Every care has been taken to ensure accuracy; in the central bureau the records of some 90,000 prisoners of war have been searched to trace the exact date of capture of labour pellagrins; the accumulating records of this section have been systematically examined in order to prevent duplication of entries for individual cases. But the influence of the diagnostic factor upon comparative statistics—as indicated in the clinical section report—necessarily detracts from their value and necessitates caution in interpretation.

The object of this section was to obtain all available evidence which might enable the Committee to reply to the specific questions of the Terms of Reference:—

(1) *Were the Prisoners of War generally infected before or after Capture?*

To determine this point as regards recent captures, two batches of prisoners of war were examined by one of us (F.D.B.), the first batch immediately on arrival at Kantara direct from the front and another three weeks later, during which interval many cases of pellagra had been admitted to hospital.

First batch examined,	1,300,	pellagrins	236	(18·0 per cent)
Second „ „	1,460,	„	71	(4·5 „)

These observations afford a very definite affirmative reply as regards recent capture.

The extent to which prisoners of previous batches suffered from pellagra after capture was estimated by charting together the monthly captures and the *per mille* pellagra incidence. The association of these two curves on Chart 1 shows that the prisoners in captivity had been giving a steady pellagra admission rate for six months, up to November, 1917, when their numbers were doubled by fresh

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captures; in the following month—not being a month of seasonal prevalence—the *per mille* admission rate rose to over three times its previous height, instead of falling to fifty per cent, as it should have done had the newcomers been pellagra-free. As the diagnoses were made by the same hospital staff, the inference is that the newcomers were much the more pellagrous, even after having left the more severe cases in their own hospitals.

This fact is most strikingly shown by the attached map indicating the areas from which 518 Turkish prisoners of war were enlisted, and the areas in which 474 were located when their pellagrous rashes first appeared—equal numbers of old and recent captures being questioned. In 405 of the 474 cases (85·5 per cent) the symptoms appeared in areas not then captured. This proportion closely agrees with that arrived at by direct questioning of 414 prisoners, of whom 345 (83·3 per cent) stated that the pellagra symptoms from which they were then suffering first appeared before they were captured.

The records tabulated from these “endemicity returns” (Appendix 7) indicate that the conditions to which pellagra was due were operative in inconsiderable degree before these men were enlisted; arose whilst the Turkish army was serving in Palestine; and were markedly diminished rather than accentuated after capture, for:—

(a) Only one man had a pellagrous rash before enlistment, and only five had seen similar cases in their families.

(b) The numbers are thus distributed:—

Onset 12 to 6 months before capture	..	..	..	40 cases
“ 6 “ 0 “ “ “ “ “	..	..	..	279 “
“ 0 “ 6 “ “ “ “ “	..	..	..	27 “
“ 6 “ 12 “ “ “ “	..	..	..	13 “

It appears therefore a reasonable deduction that conditions inducing in the Turkish army a severe incidence were remedied by conditions obtaining after capture, and that a considerable number of post-capture cases were in reality not developed *de novo* but were recurrences of pre-capture pellagra not giving marked characteristic symptoms in the initial attack.

• (2) *Is Pellagra among Prisoners of War increasing?*

The dominating influence of the diagnostic factor already referred to makes it very difficult to arrive at a definite conclusion by statistical methods, but Chart 2 presents the monthly admissions and deaths from pellagra since its first recognition in November, 1916, and in *per mille* relation to the total numbers in captivity.

From this it is seen that the first marked increase occurred in June, 1918; this was due to a relatively high incidence upon prisoners employed on labour—*vide* Chart 3.

(a) Among non-labour prisoners.

Graphs 3 and 4 give the actual and *per mille* incidences, and show that there has been no marked increase of pellagra in the non-labour camps.

When it is noted that—in terms of *per mille* per month—the admissions for all prisoners of war have never exceeded 13, while the deaths have never exceeded 5·2 (and have only thrice exceeded 3·0), pellagra can be assigned to the position to which its prevalence entitles it among the causes of sickness and death.

(b) Among labour prisoners.

An increase—the causes of which will be discussed later—commenced in the early summer of 1918.

In interpreting these graphs three important facts must be considered.

(i) The numbers involved are relatively small; the average number employed during the charted period being less than 5,000.

(ii) The initial rise is artificially abrupt, in that the opening of the new prisoner of war hospitals at Kantara led to cases being detained there during May and the early part of June. The result was that the cases were not recognized as such until the last days of June, and thus the incidence charted for cases diagnosed in June was in reality distributed over that month and May.

(iii) Consequent upon local establishment of the diagnosis of pellagra, the system was adopted of fortnightly examinations of all labour prisoners, as discussed with its bearings in the preceding clinical sections.

Subsequent to the June rise, the number of cases rapidly declined to zero level at the end of July; rose and again declined in August; but a further increase called for special attention towards the end of September, with the result that all even suspicious cases were removed—thus causing another artificial rise—and replaced by men carefully selected from non-labour camps, by the M.O. in command E. Kantara labour camp.

It was at this period that the Committee commenced its investigations, and spent some time in establishing the machinery for obtaining accurate statistics and in attempting to ascertain to what extent the recorded higher incidence at labour camps was due to the extremely developed capacity for early diagnosis, and the care exercised in warding those affording the slightest signs of failing nutrition.

These men looked remarkably fit; seldom went sick voluntarily; and promptly recovered on being transferred and struck off work. Consequently the Committee decided to await the effects of a recommended increase in diet and the onset of cool weather, while closely watching the incidence curve which still stood at less than one per cent per week.

The slow increase in October was largely due to the unduly high proportion among the above mentioned, and specially selected, new arrivals who began to augment the pellagra admissions within a fortnight of their arrival at Kantara. This led to the formation of three provisional conclusions:—

(i) That the admissions were due to development of hitherto latent pellagra cases, and not to production of that disease *de novo* in Kantara.

(ii) That, as the diet was well up to accepted standard as regards total energy value and proximate principles in relation to the very moderate work performed, the determining factor was a failure in nutrition inherent in a pre-diagnostic stage of the disease.

On its being found that the increase became more marked after the middle of the month, representations were made which resulted in cessation of labour at this camp, where all labour was at that time concentrated.

(3) *Is Pellagra increasing by Case-to-Case Infection?*

This question was approached by a study of the tent distribution of 470 cases in 150 tents of one compound at East Kantara labour camp. Appendix VII

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records both the detailed distribution and the basis of the expert actuarial opinion thereon kindly given by Mr. Bennett, of the Survey of Egypt, which may be here thus summarized. Of the 470 cases, 395 occurred in tents having a number of cases within the limits of variation as calculated on the chance distribution of a similar number of certainly non-infectious cases; 38 cases were less aggregated: and 37 were more aggregated. The evidence regarding this disease being infectious from case to case is thus wholly negative.

That view is also confirmed by the fact that of the 253 medical orderlies of No. 2 of War Hospital, employed in the pellagra wards for various intervals since November, 1916, not one has developed any signs of that disease although twelve have been so employed continuously for two years.

(4) *Is Pellagra due to Location or Local Conditions?*

The camps in which prisoners of war have been accommodated sufficiently long to enable conclusions in this respect to be drawn are those at:—

Sidi Bishr	..	For officers					
Maadi	..	„	Ottomans, Germans and Bulgars	..	..	Non-labour	
Heliopolis	..	„	Ottomans	..	..	..
East Kantara	..	„	..	..	..	..	Labour
Ludd	..	„	..	..	..	..	..

The light thrown on this problem by statistics is considerable, and advantage is taken of that fact to deal more conveniently here with certain aspects which otherwise would fall under other sections.

Striking features are that:—

(a) At the *officers' camp*, with a strength increasing from 1,900 to 4,400 during the year, the M.O. reports having had no case at his hospital which could be diagnosed as pellagra, although one officer was admitted directly after capture, and died from that disease at Cairo last month.

(b) At *Maadi* over 2,000 Germans, Austrians and Bulgars have, for the last two years, occupied a compound immediately adjoining that occupied by some 6,000 Ottomans. The occupants of both compounds have been living under similar conditions as regards water-supply and conservancy; equally exposed to biting-insects and sunlight; and similarly protected against summer heat, by matting sun-shelters, and against winter cold, by two blankets and a greatcoat per man. The only obvious difference was that of diet: the Ottomans lived upon their rations, while the Germans—being freely supplied with money through a consulate—supplemented their rations lavishly. During these two years no single case of pellagra had occurred among these Germans, Austrians or Bulgars, nor was any suspicious case found on careful inspection by one of us (F.D.B.). This formed a most striking contrast to the 300 pellagra cases which had occurred during the present year from among the Ottomans—both Turks and Arabs—the great majority of whom had also been in captivity for long periods in this camp.

(c) Among 1,840 labour prisoners transferred from *Ludd* to East Kantara on September 8 of this year, 122 were admitted to hospital for pellagra within forty-eight hours of their arrival, thus illustrating alike the importance of the diagnostic factor and the fact that pellagra incidence upon labour prisoners was not dependent upon local conditions peculiar to East Kantara labour camp.

These facts discounted the importance of certain conditions which had been under previous consideration, such as:—

(i) The use of *Nile water* : this water did not reach Ludd, but supplied the Sid Bishr, Maadi and Kantara camps.

(ii) The defective quality of the *millet* used in making bread (for Germans and Turks alike) at Maadi : this compared with excellent millet used for making bread for Kantara and Ludd. (The part possibly played by indigestibility of the somewhat doughy bread produced by admixture of ten per cent millet required further consideration.)

(iii) The considerable differences between the *fat* content of local and Argentine beef : the Ludd labour prisoners had Argentine meat as supplied to British troops.

While these factors may have played some part in the development of pellagra among the predisposed, it is obvious that they—in common with so many other general conditions too numerous for individual mention—must be eliminated from the list of possibly determining causes.

One observation of the statistical branch may be recorded as bearing upon the question of how far the depressing influences of a sense of defeat and irksome monotony affected the incidence of pellagra upon prisoners of war. The M.O. of East Kantara labour camp examined 1,000 men of the Egyptian Labour Corps at Kantara and found that 245 of them were definitely pellagrous. They performed much heavier work than the prisoners of war on a diet of almost identical caloric value, but—coming from a poverty-stricken area in which pellagra is endemic—they regarded their diet as ample ; their pellagra symptoms as incidental ; and their recurrent visits to hospital as interruptions to be cut as short as possible.

To complete the indications derived from statistical data, it is necessary to mention that :—

(a) No case of pellagra has occurred among British troops.

(b) The only case suspected among Indian troops was doubtful, and had embarked for India the day before the Committee could reach the hospital to confirm the diagnosis.

As Kantara especially was never without thousands of British (and latterly also of Indian) troops living under the same general conditions as obtained in adjacent prisoner of war camps where pellagra was meanwhile occurring, the complete immunity of British and Indian troops indicated that general hygienic conditions, and infection by biting-insects, did not call for further consideration as possible causes of this disease.

The *conclusions* were :—

(1) That pellagra has not occurred among non-Ottoman prisoners of war.

(2) That the hospital admissions show an insignificant *per mille* increase among non-labour Ottoman prisoners, but that there is no evidence to show whether this is due to freshly developed cases or to recurrent attacks in cases already pellagrous.

(3) That there has been an increase in pellagra among labour Ottoman prisoners, which appears to have some definite relation to labour, and probably also to nutrition.

(4) That the increase is not due to case-to-case infection.

(5) That the increase is not due to location, nor to local conditions, nor to infection by biting-flies¹ (*Simulium* or others).

¹ *Vide* also notes on Graph 8, page 21.

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Dietetic Section.

In view of the generally admitted association of pellagra with certain articles of diet, and the theory that some hitherto obscure dietetic factor is involved in its causation, special attention was directed to this branch of the investigation.

Information regarding prisoners' rations, both before and after capture, was collected from every available source. Actual issues were checked, inspected and sampled. Detailed daily issues for long retrospective periods were ascertained, and charted against pellagra incidence to see if there were apparent any correspondence between incidence and shortage of total rations or particular ingredients. After adding the ration value of canteen purchases (actuals), comparisons were worked out between rations of prisoners of different nationalities and their respective pellagra incidences. Collateral evidence was sought regarding diets of the E.L.C., Armenian refugees, Egyptian convicts, asylum cases, and hospital patients—military and civil. Finally the relation between pellagra and known diets in other parts of the world was brought under review. The time occupied in collecting this mass of information, and the many thousands of calculations required to reduce it to comparative terms of proximate food principles extended over several weeks, so that the final deductions were not available until a very late stage of the inquiry.

Meanwhile research proceeded in the laboratories. All foods were re-analysed from samples taken at the time of issue, or from bakeries or abattoirs at the time of inspection. Fresh meat was examined for all varieties of micro-organisms—with negative results. Series of most carefully conducted experiments were made to determine, by analysis of all faeces and urine, the comparative absorption of nitrogen and carbon by groups of healthy and pellagrous prisoners. The aberrations of metabolism were investigated in upwards of 800 prisoners, at Kantara and Heliopolis.

In the wards, the comparative effects of variations of diets were controlled by recording the alterations in weight of groups of patients.

Interim recommendations were made which led to improvements of existing ration scales, and to elimination of some minor defects noted in the quality of millet flour and the proportion of fat in meat.

Only such points will be here dealt with as have a direct bearing upon the essential question whether the increase of pellagra among the prisoners of war is due to diet, and the data are best marshalled as follows:—

(a) Consideration of the diets which, on theoretical grounds and by practical experience, are considered necessary for prisoners of war in Egypt.

(b) Tabulation of prisoners' diets for comparison, taking as the most comparable standard the diets of Egyptian convicts, whose conditions of work and pellagra incidence are precisely known.

(c) Discussion of the tabulated relevant diets—in relation to normal needs, pellagrins' needs and pellagra incidence,

A.—Dietetic Needs.

(a) Of Normal Persons.

(i) *Caloric Value.*—The standards of daily energy expenditure and minimal food requirements (on the established basis of an addition to caloric value of

ten per cent for non-absorption) for men of seventy kilogrammes weight in Northern Europe are:—

	Calories expended	Calories required	Grammes protein required
When not working	2,450	2,720	70
On light labour (60,000 kilogrammes) . .	2,780	3,090	70
On hard „ (120,000 „)	3,210	3,570	85

On the basis of the Turkish prisoners of war weighing an average of 65 kilogrammes and performing light labour (of 60,000 kilogrammes a day, with an exceptional maximum of 80,000 kilogrammes when engaged in carrying stones), the following scales are considered adequate for normal prisoners, as no deduction is made on account of the lesser requirements for maintenance of body heat in Egypt, as compared with Northern Europe:—

	Calories required	Grammes protein required
Non-labour	2,530	70
Light labour (60,000 kilogrammes)	2,870	70

(ii) The *protein requirements* are indicated above, and the accepted view at the time when diet scales for the prisoners of war were drawn up was that the balance of the calorie total could be derived from mutually interchangeable fat or carbo-hydrate, provided there was supplied a small quantity of fat required as lipoids which cannot be synthetized from carbo-hydrates.

(iii) Certain evidence derived later from German war experience suggests, however, that *fat* should not provide less than twenty per cent of the total calorie value of a diet.

(iv) Certain *accessories*, e.g., *vitamines*, are required in non-calculable amounts but are provided by a mixed diet containing the sufficient proportion of fresh food supplied to these prisoners.

(b) Of Pellagrins.

It is necessary here to summarize the results of careful research into the nutrition of pellagrous prisoners (as recorded in detail in Appendix 8), and the views formed in conformity with those and other findings bearing upon the special dietetic needs of pellagrins.

The ascertained percentage losses due to non-absorption of food principles are tabulated below for comparison. Pellagrous subjects were found to suffer from the various nutritional aberrations dealt with in a preceding section, but the prisoners specially selected by one of us (F.D.B.) as showing no sign or symptom of pellagra were regarded as “predisposed” in view of the results of this experimental test.

	Anticipated*	In the predisposed	In the pellagrous
Loss by non-absorption of protein..	23 per cent	33·6 per cent	35·1 per cent
„ „ fat ..	10 „	19·5 „	23·2 „

* Anticipated from previous knowledge regarding diets in this country, as differing from the usual loss on European diets of protein 10 to 20 per cent. and fat 5 per cent.

These results, in conjunction with the findings of the clinical and bio-chemical sections, suggest that pellagra has an insidious course before the disease can be detected by the most careful clinical examination. How far this non-absorption is possibly due to a pre-pellagrous digestive derangement is a matter of considerable interest.

B.—*Tabular Comparison of Diets.*

Serial No.	Diets	Protein value		Fat	Carbo- hydrate	Calories
		Bio- logical	Gross			
(a) <i>Standard Diets for Egyptian Convicts.</i>						
1	Hard labour (120,000 kilogrammes, proposed, <i>vide</i> note on p. 20)	45·2	121·7	48·90	612	3,464
2	Light labour (60,000 kilogrammes, existing) ..	38·7	110·6	43·00	554	3,124
3	Non-labour (for short detentions only)	31·2	95·5	33·80	494	2,729
(b) <i>Turkish Troops' Pre-capture Diets.</i>						
4	Information from captured report Sept. 29, 1917, by General Officer Commanding Sinai Front (Gen. von Kressenstein)	30·4	82·4	27·52	490	2,603
5	Average of nine estimates <i>re</i> autumn 1918 (Supply personnel and other reliable first line prisoners of war)	33·4	85·6	30·34	430	2,396
6	Average for 27th Division, August—November, 1918 (captured document regarding thirteen units)	?	?	?	?	2,606
	Minimum of above for 43rd Regiment, First Field Artillery	?	?	?	?	2,214
(c) <i>Prisoners of War Diets.</i>						
(i) <i>OTTOMAN.</i>						
<i>Labour.</i>						
10	Rations, scale, Nov. 16, 1918, to date	48·7	109·3	47·30	610	3,390
11	„ „ „ March 3, 1918, to Nov. 15, 1918	48·7	109·3	40·02	610	3,320
12	Average actual issues, June 1, 1918, to Oct. 12, 1918	45·6	102·4	33·33	560	3,026
13	Rations plus canteen extras at East Kantara, March 3, 1918, to Nov. 15, 1918	49·6	110·4	41·30	619	3,370
<i>Non-labour.</i>						
7	Rations, scale, Nov. 16, 1918, to date	39·9	97·0	42·50	524	2,941
8	„ „ „ May 1, 1917, to Nov. 15, 1918 ..	39·1	92·0	27·55	515	2,744
9	Average actual issues at Heliopolis, April 1, 1918, to Sept. 26, 1918	37·2	90·5	30·75	492	2,684
(ii) <i>NON-OTTOMAN.</i>						
<i>Germans and Bulgars.</i>						
14	Rations, scale, May 18, 1918, to Aug. 18, 1918	54·7	90·3	28·81	351	2,069
15	„ „ plus canteen extras at Maadi, Nov., 1918	89·7	144·3	120·67	458	3,589
<i>Bedouin.</i>						
16	Rations, scale, May 1, 1917, to date	42·3	102·2	28·35	510	2,766

Notes.—(1) The more important points are dealt with in the following discussion by reference to the above diets by their serial numbers.

(2) For details of these and other diets see pp. 60, 61 and 62.

The view has therefore been formed that the causes of pellagra are in operation for considerable periods (other observations suggest four or six months); that there ensues a clinically pre-pellagrous stage during which apparently healthy persons gradually approach the extreme limit of possible adjustment between normal energy expenditure and abnormal mal-nutrition; and that eventually any disturbance of that precarious balance—either by extra work or further digestive derangement—rapidly converts the subject into a clinically definite pellagrin, by establishment of a vicious cycle in which mal-nutrition and digestive derangement act and react until recovery ultimately becomes impossible

The Prevalence of Pellagra among Turkish Prisoners 445

These findings threw into prominence three matters which they invested with additional importance:—

(i) The influence of diets over a period long antecedent to the appearance of clinical pellagra.

(ii) The effect of such a general liability to lenteric diarrhoea as existed in a population suffering from chronic dysentery to the extent found in these prisoners.

(iii) The consequences of defective cooking to borderland cases just maintaining a precarious balance of metabolism.

In this connexion it is convenient to mention here that further investigation showed the food to be excellently cooked on each of the many occasions when meals were sampled by us at various camps; that it was cooked by trained cooks selected from among the prisoners; and that at East Kantara a surplus, always maintained, proved the fuel ration to be ample for cooking in the brick ranges provided.

In the meals sampled for analysis the beans were found hard, but beans were then a recent issue in lieu of lentils and they have since been soaked until germination occurs, thus incidentally showing that the diet must contain sufficient vitamine.

Note.—The general quality of food supplied was found on analysis to be well up to standard values, as determined by previous analyses and adopted in all calculations.

C.—Indications from the foregoing Table of Diets.

(a) Pre-capture Diets.

From information supplied by C.I.O., 2nd Echelon, G.H.Q., E.E.F., as obtained from captured documents and other reliable sources, selections have been made relative to periods preceding capture of the large batches of prisoners in the autumns of 1917 and 1918.

Diet 4.—General von Kressenstein reported in September, 1917, that "long-continued under-nutrition" had undermined "the stamina of the men in general"; that vegetables and "a very considerable increase of meat" were necessary; that only 75 tons of food were arriving daily instead of 150 tons; and that "at least up to the imminent decisive battle" raising of the bread ration to 100 grammes per man per day was "an urgently necessary improvement."

The actual total weight supplied to three armies amounted to only sixty-seven per cent of that provided for by ration scales.

Although at that time the Turks were heavily entrenching, and thus doing hard-labour, they received nine per cent less than the calorie value necessary for light-labour and twenty-four per cent less than the previously accepted Egyptian convict standards for hard-labour, both in total calories and in biological value of protein.

Diet 5.—Relates to the period before the final defeat and capture of the Turkish army, and is confirmed by the note to Diet No. 6 which shows that for at least one unit captured documents prove the total calorie value to have been only 2,214 calories for a sustained period of three months preceding capture.

Taking, however, No. 5 as a basis, this shows a shortage of over 16 per cent calorie value as against the light-labour standard, which is the lowest that could be considered adequate for any troops in the field.

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It is thus evident from captured documents that the Turks suffered from "long-continued under-nutrition" to a severe extent before capture. As their M.O.s state that they also suffered from diarrhœa associated with "misère physiologique," it is extremely probable that they were pellagrous during that period—as they proved to be on capture in November. Still more men must have been far advanced in the pre-pellagrous stage, ready to develop definite symptoms on the least additional demand for energy expenditure.

(b) *Post-capture Diets.*

In considering the relation between the actual issues and authorized scale of these diets it must be remembered that, during the period under review, shipping difficulties necessitated a reduction in the ration issue to British troops as compared with their ration scales. The reductions are tabulated for comparison:—

British troops, first line..	..	..	5 per cent	..	Non-labour prisoners	..	5 per cent
"	"	line of communication	10	"	..	Labour prisoners	.. 10 "

(i) *Non-labour Prisoners of War.*

Diet 9.—This is discussed as giving the lowest of the three diets under this heading. It gives an excess of six per cent calories and twenty-nine per cent of protein over the minimal standards, and exceeds in all respects the values of pre-capture diets Nos. 4, 5, and 6.

As compared with the convict diet, there is a marked advantage in biological protein value to set against a trivial difference in calorie value.

(ii) *Labour Prisoners of War.*

Diet 12.—Again, the lowest of the series is considered. As against the standard, it has a five per cent advantage in calorie value and a forty per cent advantage in protein.

It has three per cent less than the calories, but exceeds by eighteen per cent the biological protein value of the corresponding convict diet.

The energy expenditure of these prisoners at absolute rest being estimated at 2,414 calories, the balance allows 85,680 kilogrammes for labour, whereas the heaviest labour witnessed has been estimated at 80,400 kilogrammes.

In order to determine if dietetic fluctuations coincided in any way with pellagra incidence, the calorie values of the diet and its proximate principles were charted (inverted) over the incidence curve on Chart 6. A careful study reveals no parallelism between the two curves, and the chart thus offers no suggestion that the diets of those periods were responsible for the pellagra incidence. This view was borne out by the fact that, from among prisoners who had long remained pellagra-free in a non-labour camp, 500 specially-selected and apparently very fit men were sent to East Kantara labour camp, where they gave forty-two admissions to hospital for pellagra within eight days of their arrival on September 23, 1918. The diet having been shown to be adequate, the conclusion was that the cause lay in defective assimilation.

(iii) *Non-Ottoman Prisoners of War.*

Diet 15.—This is of interest in connexion with the fact that 2,000 Germans remained wholly pellagra-free during two years' confinement alongside the Turks at Maadi non-labour camp, where many Turks became pellagrous under conditions presenting only one obvious difference, viz., that of diet.

It is important to note that these Germans had apparently never been exposed to such a dietetic shortage as is associated with pellagra, and their augmented diet is both extremely full and varied for a non-labour community.

The conclusions reached at this stage were:—

(1) That the food issued to all prisoners of war was adequate for the needs of normal men, due regard being paid to the energy output required from labourers.

(2) That the cooking was such as to make their diet available for assimilation, on the normal basis of calculation.

(3) That no immediate relation can be detected between present diets and pellagra incidences.

(4) That the Turkish prisoners for long periods prior to capture were on rations not only considerably below the value of the rations that they received after capture, but also below the standard of minimal needs.

(5) That in addition to fully developed pellagrins found among prisoners at the time of capture, there were many latent pellagrins with deranged digestion and deficient power of assimilation, who, while remaining apparently healthy when at rest, very rapidly developed into clinical pellagrins when employed on work—owing to inability to assimilate the extra food given in a form suitable to provide the additional energy output required.

(6) That some dietetic deficiency stands in ætiological relation to the *de novo* development of pellagra.

(7) That no evidence has been found that any other factor than diet produces pellagra *de novo*.

* * * *

Completion of Stage II.

A round-table conference of all collaborators was held, and agreement was reached on three main conclusions with regard to the ætiology of pellagra:—

(1) That it is not caused by any general hygienic defects.

(2) That it is neither due to case-to-case infection nor to any discoverable infective agent.

(3) That it is due to some dietetic factor, the exact nature of which remained to be determined.

It was decided that work could be profitably continued only by the bio-chemical and dietetic sections, and the Committee was about to submit its final report on ætiology in the above terms when the mass of accumulated data of the dietetic section became available for detailed study which led to the extension of this investigation and to the results recorded in Stage III.

Meanwhile the other workers concluded their investigations and completed their reports.

(*To be continued.*)



Reviews.

FRACTURED FEMURS, THEIR TREATMENT BY CALLIPER EXTENSION. By Maurice G. Pearson, O.B.E., and J. Drummond. London, 1919: Henry Frowde, Hodder and Stoughton. Pp. xii + 92. Price 10s. 6d. net.

Lieutenant-Colonel Pearson's surgical monograph on fractured femurs gives a clear account of the methods which he and his colleagues have devised and perfected.

Colonel Pearson uses the Besley Extension Calliper with certain modifications of his own, utilizing the Thomas splint, counter extension being obtained from the ring of the Thomas, and extension by means of a weight and pulley, the splint being fixed meanwhile to an upright at the bottom of the bed.

Having seen his work at the Edmonton Military Hospital, where for many months he was in charge of 400 fracture beds, and having seen the most excellent team work carried out by himself, his assistants and sisters who were associated with him for a long time, we are convinced that Colonel Pearson's end results are extremely good, and all that he claims them to be.

We are of opinion that Colonel Pearson's methods, and all the special apparatus and the special bed which he uses, have a place in surgery, but the method is best applicable to a large fracture unit.

Without in any way detracting from the methods which he advocates, we believe that equally successful results may be obtained from the use of simpler methods which do not require such special apparatus or such special team work. Either the use of the Thomas splint with fixed extension as employed by the Liverpool School, or the use of the Thomas on the Hodgen principle with body counter-weight extension, so well advocated by Major Sinclair and his co-workers, will give equally satisfactory end results.

The successful treatment of a case of a fracture of the femur depends upon the amount of time and intelligence the supervising surgeon will give it, and the simpler methods appear to us to have a greater range of usefulness for the isolated cases which the general practitioner is called upon to treat.

We can confidently recommend this book more particularly to surgeons and house surgeons who are called upon to treat these injuries.

THE SURGERY OF EGYPT. By Frank Cole Madden, O.B.E., M.D. Melb., F.R.C.S. Eng., Professor of Surgery in the Egyptian Government School of Medicine, and Senior Surgeon to Kasu el Aini Hospital. Publishers: Nile Mission Press, Cairo, 1919. Pp. xxviii and 394.

In a country where the sick man, after many consultations between his attendant and many other doctors, is often accustomed to seek and follow the advice of a "holy man" or a "wise woman," it can be readily understood how difficult is the practice of the healing art as judged by Western standards; as the author of this work points out, the fatalism and neglect of the average Egyptian in cases of illness are very real obstacles in both prevention and cure in very many instances, morbid conditions so often being first brought to the notice of the trained practitioner in a shockingly advanced stage. When, moreover, the average hospital patient, on being asked how he feels, generally says, "Thanks be to God," if better, and precisely the same if he feels worse, it is obvious that the estimate of progress for good or bad must depend very greatly upon the skill and carefully repeated examinations of the physician or surgeon. For many years the author and his colleagues have laboured at Kasu el Aini against many obstacles, tangible and otherwise, to promote a new attitude of mind towards disease, primarily among their students—who must be the real missionaries—and also in the patients in their wards. We fancy that this very complete and carefully prepared work from Mr.

Madden's pen, compiled as it has been during a period of exceptional stress and anxiety, will have not the least of its lasting value in impressing upon his students the great part they are called upon to play in regenerating their homeland, for it is no new doctrine that clean and healthy surroundings are first essentials to vigour and efficiency, whether it be in commerce, husbandry, profession, or may we add—politics!

To comment fully upon Mr. Madden's contribution would provide scope for much writing; we can merely touch upon some of the most noteworthy features—noting the author's own explanation that he has followed on general lines the well known text-book of Rose and Carless.

The opening sections will interest all who know Egypt and might well be studied by intending visitors who do not perhaps realize that—during the winter months—it is *not* a land for diaphanous clothing and iced drinks!

Section III, on antiseptic methods and preparations, is a clear guide for all practitioners, founded as it is on a wide experience, while the following Section (IV) is remarkable for a good description of bilharzial ulcers, and of those rife and often shockingly neglected cases of parasitic granulomata affecting the perineal regions; the close causal relationship with the Leishman parasite is brought to the attention of the reader, and there is also a graceful tribute to the work of the author's colleagues in the elucidation of the problems of Egyptian oriental sore.

In Section V an interesting theory is offered for the prevalence of gangrene of the scrotum—from sitting for long periods in a squatting position on the cold ground.

The section devoted to specific diseases is remarkably full of valuable material, comprising a complete guide to the treatment of tetanus, an excellent article on rabies—happily greatly reduced in prevalence in Egypt by the vigorous policy of the Public Health Ministry—and a comprehensive treatise on venereal disease. It will be news indeed to many to read of syphilis being regarded as a heaven-sent visitation which should not be interfered with by treatment! The clear directions on clinical laboratory methods and technique should be extremely useful to all working in this particular branch of surgery.

The illustrations to Section VIII—it is misprinted VII—on tumours, are an example of the neglect of their diseases by many of the natives.

In the following section on theatre work is an excellent summary of the subject of spinal anaesthesia which has been, for many years, a striking feature in the surgical services of the author and his colleagues at Kasu el Aini; to see a patient smoking a cigarette and joking with one of the theatre attendants while the surgeon is hard at work on a knee-joint or an inguinal hernia, is almost startling to a visitor who may be little familiar with the method.

Under diseases of the skin will be found a full description of Nile boil; diseases of the skin in this "land of parasites," as Mr. Madden calls it, are manifold—indeed it is almost a wonder that the fellahs who reach adult life still have any normal skin or mucous membrane left!

To bilharziosis—one of the worst if not *the* worst of the modern plagues of Egypt—the author devotes much careful description, and includes an interesting historical sketch of Bilharz and his work at the Cairo school, which was founded by Clot Bey.

Abscess of the liver is fully dealt with, and the account should be carefully read and never forgotten by everyone who may practise the healing art in countries where it is at all likely to be met with; by so doing many a tragedy may be averted and many a reputation saved.

Interesting points in the section on diseases of the eliminatory tracts are the rarity of rectal cancer—its place is more than malignly taken by bilharzial disease!—and the domination by the same parasitical condition in affections of the urinary system; Mr. Madden says indeed, "We have generally to assume that bilharziosis exists."

The work concludes with a chapter on surgical anatomy which should be most useful to all aspirants to surgical craftsmanship.

The book is copiously illustrated and there are remarkably few misprints; in fact, in spite of the wartime conditions under which it has been compiled and produced (and that by Egyptian compositors), the author is to be congratulated upon his valuable offering to the library of both student and colleague.

THE PRACTITIONER'S MANUAL OF VENEREAL DISEASES. By A. C. Magian, M.D., Hon. Surgeon, Manchester French Hospital, etc. London: W. Heinemann, 1919. Pp. viii and 215. Price 10s. 6d. net.

This is an attempt to outline in a little over two hundred pages all that a practitioner should know about a very large subject. The author has managed to mention most of the methods employed in the modern diagnosis and treatment of venereal diseases, with most of the manifestations, but that is about all.

We can conceive that this work would be useful to anyone who wished to learn in a general way about the signs and treatment of venereal diseases, and, being written in simple language, the book would easily be read by a layman. But the descriptions appear far too abbreviated in many instances to prove of practical value to the practitioner.

The only staining method for the gonococcus which is described is that by carbol-methylene blue. The Gram method, surely the only reliable one for the gonococcus, is merely mentioned. The author must have very good eyesight, since he recommends examination with a $\frac{1}{2}$ -inch objective and a No. 1 eyepiece. The shape of the gonococcus is described but we could find no mention of its characteristic distribution within the pus cells.

On p. 84 dark-ground illumination is dismissed in fifteen lines, though the paragraph commences, "If the specimen is to be examined by the practitioner himself." The practical working details are meagre and we cannot help the thought that here the author is crediting the practitioner with considerably more knowledge than he does on the first page, which commences with a very elementary description of the different venereal diseases.

In the description of gonorrhœa of women on p. 59 we are told to make a microscopical examination of the secretion from the various parts including the cervix. This involves, of course, the introduction of a speculum, but it is only after the specimens have been taken that "the external genitals are now shaved and disinfected."

In the complications of gonorrhœa due prominence is given to gonorrhœal ophthalmia, but we should have thought that the considerably more common complications of conjunctivitis due to endogenous infection was worth more emphasis than the statement that it "is also met with."

We are told on p. 97 that the saliva is not infectious. In the impression it conveys, this statement is really dangerous. Admittedly the saliva may not contain the organism as it issues from the ducts, but, in a patient suffering from secondary mouth lesions, it becomes mixed with infectious secretion. For practical purposes in this connexion saliva is the liquid which may be emitted from the mouth and, considered as such, is decidedly infectious.

Such faults as those we have mentioned are inevitable in a work which is so condensed as this. In our judgment a practical account of venereal diseases cannot be managed in the space.

The book contains some interesting historical references to venereal diseases from the Bible, Shakespeare and other literature. It is illustrated by figures of most of the surgical instruments employed in this branch of medicine and by some valuable pictures of Frankel's exercises for tabetics. For the rest, as mentioned, it is a useful summary of current practice, though not likely to be of much practical assistance to the beginner.

Journal
of the
Royal Army Medical Corps.

Original Communications.

A NEW MOSQUITO OF THE GENUS ORTHOPODOMYIA FROM
A BEECH TREE-HOLE IN ENGLAND:

By CAPTAIN MALCOLM E. MACGREGOR.

Royal Army Medical Corps.

Officer in Charge of War Office Entomological Laboratory, Kent.

DURING the past few months certain investigations on the English anophelinæ have been in progress at this laboratory, and among larvæ collected by Major Angus Macdonald, R.A.M.C., from a beech tree-hole in Epping Forest, where *A. nigripes* were present in large numbers, I recognized a new culicine species. The mosquitoes that bred out were sent to Mr. F. W. Edwards of the British Museum, who confirmed the find, and he referred the species to the genus *Orthopodomyia*.

I succeeded later in obtaining other specimens (larvæ and pupæ) from the same tree-hole and these have been bred out in the laboratory here. The mosquito has so far, however, not been found elsewhere in the forest,¹ although a large number of other beech tree-holes have been examined.

The mosquito is a black-and-white species with conspicuous and beautiful ornamentation.

Orthopodomyia albionensis sp. nov. ♂ ♀.

Antennæ.—Black, with a patch of white scales on the inner sides of the basal joints.

Palps.—Penultimate joints much longer than the terminal joints. Palps of the ♂ slightly longer than the proboscis, and in the ♀ about half as long as the proboscis. ♂ palps black with white scales at the bases,

¹ Since the above was written I hear that Mr. Hugh Main has found larvæ of this species in another tree-hole in Epping Forest.

white bands at the joints, and a white terminal joint. ♀ palps black with some white scales at the bases, a white band at about the middle, and white terminal joints.

Proboscis.—Black, with a white band situated at a point some two thirds of the length of the proboscis from the basal end.

Head.—Black in ground colour, with a line of white scales encircling the upper border of the compound eyes. These lines of scales meet in the middle line and the scales extend for a short distance down the vertex. Nape of the head clothed with numerous black forked scales, long black hairs, and a large number of brilliantly white curved scales.



Thorax.—Black in ground colour, ornamented with six parallel lines of white scales, and long black hairs. The lines at the middle point of the thorax are nearly equally inter-spaced. The two outermost lines border the dorsal edges of the thorax. The middle pair of lines diverge from each other at about the middle point, become somewhat broader, and cross the scutellum, the terminal scales actually hanging over its edge. The two intermediate lines between the outermost and middle pairs are only half the length of the latter. These lines start about the middle of the thorax, and the terminal scales slightly overlap on to the scutellum. Pleura ornamented with broad lines of white scales.

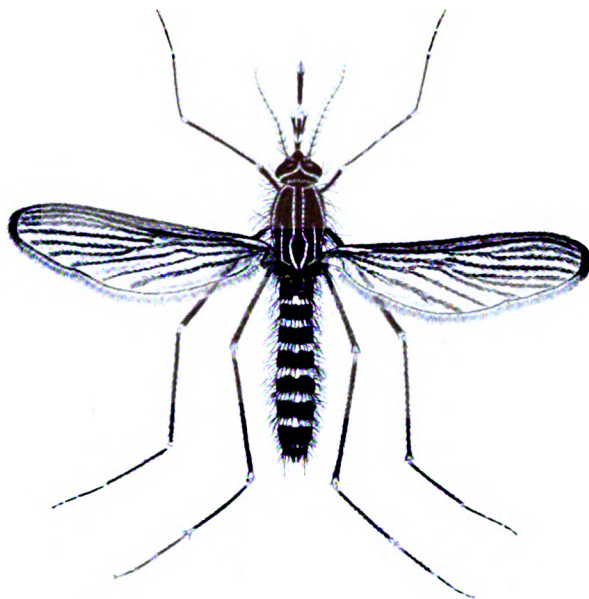
Wings.—Black scaled, except at the basal end of the first longitudinal vein, which is clothed with silvery white scales to the extent of about one millimetre. Fork cells unusually long, especially the lower.

Abdomen.—Blackish-brown in ground colour, clothed with long black hairs, and (except the first abdominal segment) ornamented with bands of

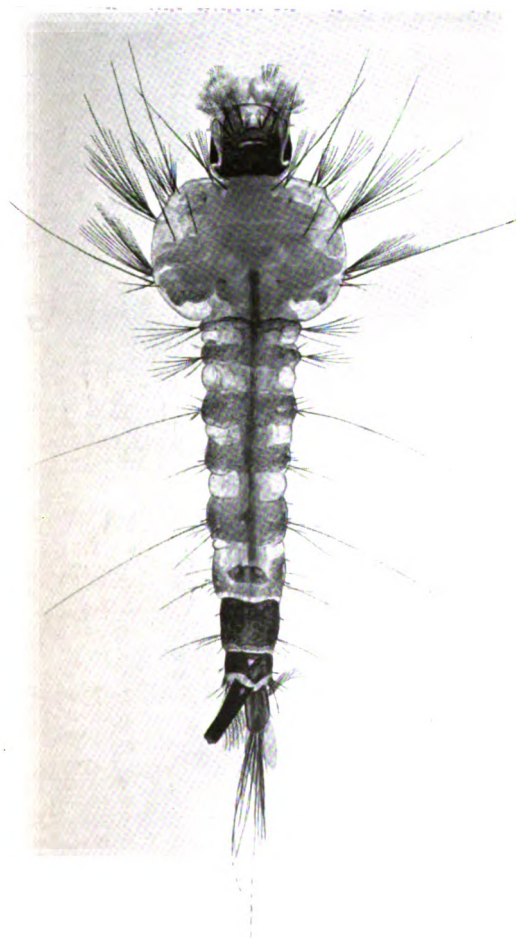
A
NEW MOSQUITO

of the genus
Orthopodomyia
from a beech tree
hole in England.

To illustrate
Capt. M. E. Macgregor's
Paper on "A New Mosquito
of the genus *Orthopodomyia*
from a beech tree hole in
England."



Orthopodomyia albionensis
Sp. nov.



CAUDAL EXTREMITY
OF LARVA

black and yellowish-white scales on each of the segments. Each of the segments practically divided with equal bands of black and yellowish-white scales, the latter being situated basally. The first abdominal segment differs from the other segments in that it has a fan-shaped patch of white scales situated medianly, on each side of which there are long black hairs projecting backwards.


Legs.—Coxæ with a patch of white scales on the anterior aspects. Upper ends of the femoræ yellowish, lower ends purple-black, with numerous white scales scattered on the dorsal surface. The purple-black scales on the legs have a metallic sheen. Knee spots white, the white scales embracing the ends of both the femoræ and tibiæ. In the hind pair of legs the tibiæ are purple-black with numerous white scales scattered along their length. Tarsal joints (1-4) white banded at the joints, the bands embracing both ends of the joints. Fifth tarsal joint all white. In the front and middle pair of legs, only the knee spots and first tarsal joints are white scaled. The other tarsal joints are unbanded, but some of the scales on these tarsal joints, and on the fifth tarsal joints especially, may be fawn coloured. In the ♂ the fourth tarsal joints of the fore and middle pairs of legs are much shorter than the third and fifth tarsal joints.

Claws.—These are remarkable. In the ♂, the claws of the fore and middle pairs of legs are large and unequal in size and structure. The fore legs carry claws on the inner side of the terminal tarsal joints that are "toothed" with a single spine, while the claws on the outer side of the joints are smaller than the companion "toothed" claws, and are untoothed. On the other hand, the claws of the middle pairs of legs carry similar unequal claws, but the arrangement is reversed, the "toothed" claws being on the outer sides of the terminal tarsal joints. The claws of the hind pairs of legs are small, equal in size, and untoothed. In the ♀ all the claws are small, equal in size, and untoothed.

Length of body 5.5 millimetres, length of proboscis 3 millimetres.

Beech tree-hole, Epping Forest, Essex, England.

Eight females and five males taken as larvæ and bred out in the laboratory at Sandwich.

Mature Larvæ.—The larvæ  life are of a semi-transparent pale lilac colour and measure about 7 millimetres in length, by 2.5 millimetres across the thorax. The thorax is unusually broad, and the abdomen is markedly truncated, with the terminal joints chitinated, so that the larvæ are easily distinguished by the naked eye from the other culicinæ larvæ *O. geniculatus* with which they were associated.

The head is large and about as long as it is broad, with the eyes set well back.

The antennæ are straight, well developed, light in colour, and have a small tuft of hairs at a point situated rather more than one third of the length of the antennæ from the base. Frontal hairs plumose, dark and stout. The two median hairs are small and short; the four adjacent hairs

long and heavier ; while the other hairs are considerably shorter. The thoracic hairs are mainly arranged on the margin, and are plumose and conspicuous. There are a few long straight hairs on the dorsal surface of the thorax. First and second abdominal segments with a lateral plumose tuft, the remaining segments bearing long scattered hairs.

On the dorsal surface of the sixth abdominal segment there is a small chitin plate roughly oval in outline and about 0·4 of a millimetre in transverse length. The seventh abdominal segment is heavily chitinized by a large plate that completely covers the dorsal and most of the lateral aspects of the segments. The ventral aspect of the segment is unchitinized. The eighth abdominal segment is likewise covered by a heavy chitin ring which comes round to the ventral aspect, but is there incomplete, leaving the median part of the segment unchitinized. Anal segment with a ventral chitin plate situated about the middle of the segment, but it does not extend to the dorsal aspect, although it embraces the sides of the segments to a slight extent. There is also a small narrow chitin plate bordering the bases of the anal segment, and situated laterally.

The comb is formed of two rows of spines arranged in arched lines. The spines (six in number) in the posterior row are heavier and longer than the spines (ten in number) in the anterior row. There is also a single spine situated behind the posterior row near the middle point.

Siphon dark, and about four times as long as its breadth at the base. The siphonal and subsiphonal plumes are conspicuous. The former are situated at a point on the ventral surface of the siphon about one third of the length of the siphon from the base.

The anal segment is somewhat longer than it is broad, and the tufts of hairs on the dorsal and ventral surfaces are simple, long and dark brown in colour.

Papillæ unequal. The dorsal pair being about as long as the anal segment, while the ventral pair are only one third of this length.

I have not seen any but fully grown larvæ myself, but I take the following from a recent letter to me by Mr. F. W. Edwards: "The two (larvæ) which Main gave me were in the third stage, and they have the thorax and abdomen of a fairly uniform light red colour, thus differing strikingly from the fourth stage larvæ we had before. They also lack the abdominal plates, and, like the fourth stage larvæ, appear to be identical in structure with the North American *O. signifer*, Coq."

Pupa.—There is a well-marked keel medianly situated at the anterior end of the thorax.

The discovery of this mosquito is interesting as there is no species of the genus hitherto reported from England.

AN ANALYSIS OF SEVENTY-SIX CASES OF GAS GANGRENE OCCURRING AT A BASE HOSPITAL, WITH REMARKS ON THE RESULTS OF SERUM TREATMENT.¹

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At this hospital an opportunity was afforded of comparing the results of ordinary surgical treatment of gas gangrene with those obtained by the employment of serum in addition.

The series is too small to base any very definite conclusions upon, but is uniform in that the surgical measures were all carried out under the supervision of one surgeon, Major J. Everidge, R.A.M.C.(T.F.), F.R.C.S., and the bacteriological examinations were all made by the writer. With regard to the bacteriology of the cases my investigations are not yet complete, and no doubt as my experience increased my results became more accurate. It is probable that such pathogenic anaerobes as *Vibrio septique* and *Bacillus œdematiens* were overlooked in some of the earlier cases.

When massive gas gangrene develops, physician, surgeon, and serologist feel that it exceeds their art to successfully deal with it in the majority of instances, and that the great hope for the future lies in the domain of prevention. The prevention of tetanus has been successful through the use of antitetanic serum and the same may yet be true with regard to gas gangrene.

In the prevention of tetanus it has been found necessary to give prophylactic injections even for the simplest wounds. This will not be necessary in the case of gas gangrene and one object of my analysis is to show the type of wound which subsequently developed gas gangrene, and the time after the infliction of the injury of the onset of the morbid process. This analysis is based on experience at a base hospital, and deals with patients who had in the majority of instances been previously treated at a casualty clearing station. I am aware that at the Front and up the line fulminant cases occur, and that these may result from injuries different from those included in this list. Experience everywhere indicates that the serum must be given at the very earliest possible moment. If a wounded man has not shown signs of gas gangrene within three or four days of the receipt of the injury little apprehension need be felt with regard to this complication. One now understands the attitude of the

¹ A Report to the Medical Research Committee.

old surgeons towards "laudable pus," as once suppuration has developed the invasive powers of the anaerobic flora of the wound are held in check. It is the presence of a thin watery serous blood-tinged fluid in a wound that makes the surgeon uneasy, especially if there is a foul smell present and bubbles of gas can be palpated or expressed.

When gas gangrene develops comparatively late it will generally be found that the wound has been insufficiently opened up, that foreign bodies have eluded the surgeon, that a hæmatoma has become infected, or that for some reason the circulation of blood in the region of the wound has been obstructed. The investigation of the flora of gas gangrene wounds is most important, and it is satisfactory that bacteriologists agree in finding that the number of pathogenic anaerobes capable of causing gas gangrene is limited to comparatively few species.

Before the war the information regarding anaerobes was chaotic and contradictory, and it is only now that order is beginning to appear. The evidence with regard to the predominant part played by the *B. welchii* is overwhelmingly strong, but I have an impression that the ease with which this micro-organism can be cultivated has led to the overlooking of the *V. septique*, *B. œdematiens*, and other more feebly growing varieties. It is to be hoped that a strong anti-*B. welchii* serum will protect against the majority of the strains of this micro-organism. By themselves *B. sporogenes* and *B. tertius* are practically harmless although they and the various aerobes—staphylococci, streptococci, proteus bacillus, etc.—may assist the pathogenic anaerobes in overcoming the defensive mechanism of the patient.

With this brief introduction the object of the information presented on pp. 460-469 in tabular form will be evident.

I.—SUMMARY.

The results of treatment may be expressed in tabular form as follows:—

<i>No Serum given.</i>								
Part affected			Number of cases		Number of recoveries		Number of deaths	Mortality rate per cent
Buttock ..	..	..	7	..	3	..	4	57
Thigh ..	..	..	12	..	2	..	10	83
Leg and foot..	..	..	10	..	7	..	3	30
<i>English Serum.</i>								
Buttock ..	..	..	1	..	0	..	1	—
Thigh ..	..	..	1	..	1	..	0	—
Leg and foot..	..	..	4	..	3	..	1	25
<i>Weinberg's Pasteur Institute Serum.</i>								
Thigh ..	..	..	13	..	6	..	7	54
Leg and foot..	..	..	10	..	7	..	3	30

Remarks.—The numbers are too small to base any definite conclusions upon, but it would appear that where gas gangrene has developed in the leg or foot and has been treated by ordinary operative measures the mortality is likely to be thirty per cent, and that doses of serum such as

were given by me will not modify the result. In gas gangrene of the thigh the serum may have been of benefit; the case mortality amongst those who had no serum was eighty-three per cent, whilst it was fifty-four per cent among those injected with Weinberg's serum.

No Serum given.

Part affected			Number of cases		Number of recoveries		Number of deaths		Mortality rate per cent
Shoulder	..	..	4	..	4	..	0	..	—
Arm	..	..	2	..	1	..	1	..	—
Forearm and hand	..	..	5	..	4	..	1	..	—
			11		9		2		18.2

English Serum.

Shoulder	..	..	2	..	2	..	0	..	—
Arm	..	..	1	..	0	..	1	..	—
			3		2		1		33.3

Weinberg's Pasteur Institute Serum.

Shoulder	..	..	2	..	2	..	0	..	—
Arm	..	..	1	..	0	..	1	..	—
Forearm	..	..	1	..	1	..	0	..	—
			4		3		1		25

Remarks.—The case mortality from gas gangrene of the upper limb averages about twenty-two per cent, and in this series the administration of serum was of no benefit.

II.—INCUBATION PERIOD.

In forty-two of the seventy-six cases investigated, definite symptoms of gas gangrene appeared within forty-eight hours from the receipt of the wound. In twelve the signs and symptoms were first noticed on the third day. In approximately fifty-five per cent of the cases the incubation period is less than forty-eight hours, and in about fifteen per cent it is more than forty-eight hours but less than seventy-two hours.

The facts regarding the remaining cases may be tabulated as follows:—

Day	4th	5th	6th	7th	8th	10th	11th	14th
Number of cases..	4	6	3	3	3	1	1	1
History of secondary hæmorrhage and ligature of vessels in	1	1	1	2	1	1 throm- bosis	0	0
Other remarks ..	..	1 infected hæma- toma	..	1 trench foot	..	..	1 infected hæma- toma	1 case of septicæmia with staphylococci, strepto- cocci and <i>B. welchii</i> cul- tivated from blood dur- ing life

Where gas gangrene develops after forty-eight or seventy-two hours it will often be found that some obstruction to the supply of blood to the wounded tissues and especially to the lacerated muscles, has occurred. In about one-third of the cases in my series there was a history of secondary hæmorrhage and ligature of vessels. A hæmatoma may become infected at a fairly late date with *B. welchii* and set up gas gangrene.

The gradual and increasing anæmia of the wound resulting from pressure of œdematous fluid, etc., on the vessels, and from intravascular thrombosis, may produce at a late date the conditions under which gas gangrene can develop.

CONCLUSIONS.

(1) The serum treatment of gas gangrene in my experience was of doubtful benefit. It is possible that if larger doses had been given, and if the serum had been injected into the affected part, the results might have been better.

(2) The case mortality of gas gangrene of the upper limb is about twenty-two per cent. and of the leg and foot is thirty per cent. The results were similar in serum treated and untreated cases. In gas gangrene of the thigh the mortality was fifty-four and eighty-three per cent respectively among the cases treated with and without serum. In looking into the nature of the cases and taking all the circumstances into consideration I do not consider that this difference was mainly due to the use of serum.

(3) In forty-two of the seventy-six cases the signs and symptoms of gas gangrene appeared within forty-eight hours. In twelve others on the third day. The *B. welchii* is the predominant infective agent in gas gangrene. It was present in seventy-four of the seventy-six cases in the series. The two cases in which it was absent were (a) gas gangrene appearing as a sequel to trench feet, (b) gas gangrene of thigh where a peculiar bacillus of the *Vibrio septique* group—the *B. tumefaciens*¹—was present.

The bacilli met with in the seventy-six cases were as follows: *B. welchii*, 74; *B. sporogenes* (Metchnikoff), 41; *B. tetani*, 24; *B. tertius*, 13; *Vibrio septique*, 2; *B. œdematiens* (?), 2; *B. tumefaciens*, 1; *B. fallax* (?), 1.

The technique employed by me has been described in previous papers.² I relied on cultural methods, and no doubt if I had inoculated animals I would have been more successful in isolating the *Vibrio septique*.

¹ Vide *Lancet*, April 19, 1919.

² *Lancet*, May 12, 1917, p. 724; *British Medical Journal*, November 23, 1918.

It is, however, satisfactory that apparently only a very few species of anaerobic bacteria cause gas gangrene, and this renders feasible the production of a serum which would be potent as a prophylactic or therapeutic agent in the immense majority of the cases.

I have great pleasure in expressing my indebtedness to Lieutenant-Colonel G. N. Biggs, R.A.M.C.(T.F.), the Officer-in-charge of 54th General Hospital; to Major John Everidge, R.A.M.C.(T.F.), the Officer-in-charge Surgical Division, 54th General Hospital; to Colonel Andrew Fullerton, C.B., C.M.G.; and especially to Colonel S. L. Cummins, C.M.G., for facilities and assistance in carrying out this investigation.

NO SERUM GIVEN.

Wounds of Buttock.

Initials	Date of wound	Nature of wound	Date of definite signs of gas gangrene	Treatment	Anaerobes cultivated	Remarks
R. W.	16.8.17	Wound of right buttock, no fracture	17.8.17	17.8.17 Most of gluteus maximus removed.	<i>B. welchii</i> ..	Patient recovered
T. G.	12.10.17	Wound of right buttock, no fracture	16.10.17	12.10.17 Wound excised 15.10.17 Hematoma evacuated and gluteal artery tied 16.10.17 Gas gangrene which had developed treated by excision of the gluteus maximus and by warm fomentations	.. ..	" "
H. H. G.	13.1.18	Wound of left buttock	15.1.18	15.1.18 Two foreign bodies removed and khaki cloth. Gas was present, but muscle not much involved. Excision of muscle and wound left open	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. tetani</i>	" "
G. P.	27.3.18	Extensive wounds of right buttock and thigh, no fracture	2.4.18	30.3.18 Several foreign bodies removed. Local treatment of wounds	<i>B. welchii</i> and <i>B. tetani</i>	Died 2.4.18
B. H.	9.4.18	Wound of left buttock; spine of ischium fractured	16.4.18	Excision of wounds. On 14.4.18 hemorrhage from wound controlled	<i>B. welchii</i> and <i>B. tetani</i>	Died 16.4.18. Post-mortem showed gas gangrene of buttock muscles, and pelvic cellulitis
B. A.	9.4.18	Through-and-through wound inside of thigh (left) and buttock	11.4.18	10.4.18 Two foreign bodies removed. No further operation. Gas gangrene of thigh very extensive	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. tetani</i>	Died 11.4.18
B. R.	2.9.18	Wound of right buttock; slight fracture of ischium	16.9.18	8.9.18 Wound excised and foreign body removed from neck of femur 4.9.18 Hemorrhage from buttock, wound stitched 7.9.18 Wound inflamed and stitches removed. Patient developed symptoms of septicæmia. Blood taken for culture on 16.9.18 at 11.30 a.m. yielded cultures of streptococci, staphylococci and <i>B. welchii</i> . <i>B. welchii</i> was cultivated from the clot	<i>B. welchii</i> ..	Died 3.20 a.m., 17.9.18

Wounds of Leg and Foot.

G. A.	1.8.17	Penetrating wound of right os calcis	2.8.17	2.8.17	Part of os calcis removed. Foreign body not found	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. tetani</i>	Died 7.8.17. Skin of left heel was black and bullae were present. Metastatic gas gangrene
H. H.	28.9.17	Wound of right leg; no fracture	3.10.17	29.8.17	Foreign body removed and abscess evacuated	<i>B. welchii</i>	Patient recovered
H. F.	7.10.17	Through - and - through wound of left leg. Fracture of fibula. Posterior tibial vessels and nerve severed	8.10.17	8.10.17	Secondary hemorrhage and ligature of vessel. Gas gangrene followed and leg was amputated through thigh	"	Died 15.10.17
P. C.	28.11.17	Through - and - through wound of left foot. Cuneiform comminuted	30.11.17	30.11.17	Amputation above left knee. Septic stump of left thigh cleansed	<i>B. welchii</i> and <i>B. sporogenes</i>	Died at 1.25 p.m., 5.12.17
K. E.	14.1.18	Trench feet..	21.1.18	21.1.18	Wound excised and fragment of bone removed	<i>B. sporogenes</i> and <i>B. tetani</i>	Patient recovered
R. C. V. S...	20.3.18	Wound of right leg; hematoma	25.3.18	25.3.18	Foot gangrenous; Syme's amputation	<i>B. welchii</i> and <i>B. sporogenes</i>	"
H. W.	20.3.18	Compound fracture of right tibia and fibula	28.3.18	28.3.18	Heel flap slightly discoloured	<i>B. welchii</i>	"
R. A. W.	9.4.18	Wound of right leg, no fracture	11.4.18	11.4.18	Leg swollen and crepitations up to Poupert's ligament. Flush amputation through upper third of thigh	<i>B. welchii</i> and <i>B. sporogenes</i>	"
H. S.	9.4.18	Compound fracture of left foot	11.4.18	11.4.18	Amputation of left foot above ankle as gas gangrene was present in it	<i>B. welchii</i>	"
					Amputation of right foot for ordinary gangrene	<i>B. welchii</i>	"
					Two foreign bodies removed from right leg; leg swollen	<i>B. welchii</i> and <i>B. sporogenes</i>	"
					Was excised and suspicious muscle dissected out	<i>B. welchii</i>	"
					Amputation	<i>B. welchii</i>	"
					Secondary hemorrhage. Gas gangrene was just starting when limb was amputated	<i>B. welchii</i> and <i>B. sporogenes</i>	"
					Amputation through thigh ..	<i>B. welchii</i>	"
					Amputation of foot. Gas gangrene present	<i>B. welchii</i>	"

NO SERUM GIVEN (continued).

Wounds of Leg and Foot (continued).

Initials	Date of wound	Nature of wound	Date of definite signs of gas gangrene	Treatment	Anaerobes cultivated	Remarks
S. J.	12.4.18	Wound of popliteal space..	19.4.18	14.4.18 Foreign body removed. Popliteal artery and vein ligated 19.4.18 Amputation through lower third of right femur on account of incipient signs of gas gangrene.. Temperature 103° F.	<i>B. welchii</i> and <i>B. sporogenes</i>	Patient recovered
<i>Wounds of Thigh.</i>						
E. E.	21.3.18	Through - and - through wounds of thighs, no fracture	27.3.18	Foreign body removed. Wounds cleansed. Secondary hemorrhage after operation. On admission on 27.3.18 was moribund and gas gangrene extensive in left thigh	<i>B. welchii</i> , <i>B. tertius</i> , and <i>B. sporogenes</i>	Died 27.3.18
G. S.	23.3.18	Wound of right thigh, no fracture	28.3.18	Two foreign bodies removed.. Thigh swollen and gas gangrene commencing. Wound opened up and muscle excised	<i>B. welchii</i> , <i>B. sporogenes</i> , and <i>B. tertius</i>	Patient recovered
S. C. J.	23.3.18	Wound of right thigh, no fracture	2.4.18	Foreign body removed .. Symptoms of local tetanus. Anti-tetanic serum given 2.4.18 Excision of vastus externus and adductors for gas gangrene; femoral vessels were found to be thrombosed	<i>B. welchii</i> , <i>B. sporogenes</i> , <i>B. tetani</i> and <i>B. tertius</i>	Died 2.4.18
I. ..	11.4.18	Through - and - through right thigh	15.4.18	Wounds excised ..	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. tertius</i>	Patient recovered
W. W. S. ..	29.9.18	Wounds of both thighs ..	7.10.18	Wounds excised .. Wound of buttock and back of thigh (right) opened upwards. Extensive gas infection. All hamstrings, inner half of adductor magnus and outer half of vastus externus excised	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. tertius</i>	Died 8.10.18

P. P.	31.10.18	Wound back of right thigh	2.11.18	1.11.18 Foreign bodies removed 2.11.11 Vastus externus and biceps dissected away	<i>B. welchii</i> ..	..	Died 11 p.m., 2.11.18
R. G. W.	7.10.17	Through - and - through wound left thigh; no fracture	10.10.17	Wound excised and opened up 11.10.17 Wound excised	<i>B. welchii</i> and <i>B. sporo-</i> <i>genes</i>	..	Died 13.10.17
T. P.	5.8.17	Penetrating wound left thigh	11.8.17	Foreign body removed .. 10.8.17 Wound opened up and drained 11.8.17 Excision of gangrenous muscle	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. tetani</i>	..	Died 11.8.17, half- hour after opera- tion
McG. J.	28.9.17	Wound involving compound fractured right femur	29.9.17	Wound excised; foreign body not found	<i>B. welchii</i> and <i>B. tetani</i>	..	Died 1.10.17
D. D.	26.10.17	Three small wounds of left thigh	29.10.17	30.9.17 Amputation through thigh 27.10.17 Foreign body removed. Tem- perature 102° F. 29.10.17 Excision of vastus internus and crureus	<i>B. welchii</i> and <i>B. sporo-</i> <i>genes</i>	..	Died 6 p.m., 29.10.17
L. T.	30.11.17	Large wound at back of thigh (left), sciatic nerve and profunda femoris divided	1.12.17	Excision of wounds. Mori- bund on admission	<i>B. welchii</i> ..	..	Died 2.40 a.m., 2.12.17
C. E.	8.3.18	Compound fracture middle one-third of femur (left), severe flesh wounds	16.3.18	Gas in wound but muscles not affected	<i>B. welchii</i> ..	..	Died 23.3.18
<i>Wounds of Shoulder.</i>							
McC. B. V.	6.4.18	Wound of right shoulder..	8.4.18	Excision of pale muscle ..	<i>B. welchii</i> ..	..	Patient recovered
M. H. V.	7.5.18	Wound of back in region of left scapula; no fracture	11.5.18	Incision and excision of gan- grenous muscle in region of left scapula	<i>B. welchii</i> and <i>B. ter-</i> <i>tius</i>	..	" "
E. G. E.	12.4.18	Compound fracture of right humerus and wound of right shoulder	14.4.18	Excision of head of humerus and of gangrenous muscle	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. tetani</i>	..	Died 26.4.18 from secondary hemor- rhage. Gas gan- grene had been arrested
C. P.	12.8.17	Wound of right shoulder; no fracture	13.8.17	Wound opened up and two foreign bodies removed	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. tetani</i>	..	Patient recovered
<i>Wounds of Arm.</i>							
M. T. E.	15.4.18	Compound fracture of left humerus	17.4.18	Affected muscle excised; in- cipient gas gangrene	<i>B. welchii</i> and <i>B. ter-</i> <i>tius</i>	..	Patient recovered
R. C.	11.10.17	Shell wound of left arm with compound fracture of humerus	13.10.17	Foreign bodies removed; wound excised; amputa- tion of arm	<i>B. welchii</i> ..	..	Died 17.10.17

NO SERUM GIVEN (continued).
Wounds of Forearm and Hand.

Initials	Date of wound	Nature of wound	Date of definite signs of gas gangrene	Treatment	Anaerobes cultivated	Remarks
L. D. J. ..	27.3.18	Lacerated wound of left hand; carpal and metacarpals fractured	29.3.18	Amputation through lower forearm; gas gangrene of palmar muscles	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> , <i>B.</i> <i>telani</i> , and <i>B. teritus</i>	Patient recovered
H. R. T. ..	21.9.17	Wound. Compound fracture of right forearm	22.9.17	Amputation of right arm below shoulder-joint for gas gangrene	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. telani</i>	Died 28.9.17
E. C. ..	23.9.17	Through- and - through wound of forearm	26.9.17	Incision of stump of triceps Incisions over pectoralis major Interosseous artery tied	<i>B. welchii</i> and <i>B.</i> <i>sporogenes</i>	Patient recovered
C. M. J. J. ...	28.3.18	Comminuted fracture of radius and ulna (left)	31.3.18	Free incisions of cedematous arm Amputation through arm Limb swollen and gas gangrene just commencing when amputation was made	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. telani</i>	"
F. W. ..	18.4.18	Wound of left arm with fracture of upper end of radius and ulna	23.4.18	Foreign body removed Flush amputation through mid arm on account of gas gangrene in triceps	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. telani</i>	"

TREATED WITH ENGLISH SERUM.

Wound of Buttock.

B. W. M. ...	26.4.18	Wound of right arm, compound fracture of humerus; wound of right ankle	28.4.18	Right foot amputated	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> , <i>B.</i> <i>teritus</i> and <i>B. telani</i>	Died 15.5.18
			28.4.18	Amputation of right arm near shoulder-joint on account of gas gangrene in arm		
			28.4.18	10 c.c. V.W.G. 19A serum		
			29.4.18	Ditto		
			30.4.18	Ditto		
			4.5.18	Gas gangrene of gluteus maximus (right); excision of muscle; 10 c.c. at operation; 10 c.c. in evening; 5th, 6th and 7th 10 c.c. of serum night and morning. 8.5.18 10 c.c. serum; wound had improved. 12.6.18 wound very foul. 13.5.18 sloughing. 20 c.c. serum under skin		

B. J.	27.4.18	Wounds of thigh and foot, fracture of bones of foot	28.4.18	Wound of Thigh.		B. welchii, V. septique?	Patient recovered
				28.4.18	Thigh resonant. Foreign body removed and muscles excised. Amputation of foot; 10 c.c. of anti-gas serum V.W.G. 19A given		
				Wounds of Leg and Foot.			
B. A.	9.4.18	Wound of left leg with compound fracture of tibia	10.4.18	9.4.18	Wound excised	B. welchii, B. sporogenes,	"
				10.4.18	Amputation below knee	B. cademians?	"
				17.4.18	Amputation above knee 10 c.c. of anti-gas serum G 8A given	B. tertius	"
C. H.	12.4.18	Compound fracture of right fibula	16.4.18	13.4.18	Hemorrhage from posterior tibial artery	B. welchii ..	"
					Femoral tied in Hunter's canal		
				16.4.18	Amputation through thigh. Gas gangrene commencing in calf muscles. 20 c.c. G3 anti-gas serum (B. & W.) given		
W. J. A.	18.4.18	Wound of leg and left knee joint	19.4.18	19.4.18	Amputation at casualty clearing station for gas infection	B. welchii ..	Patient died 21.4.18
				21.4.18	Gas infection of stump present. 30 c.c. anti-gas serum V. W. G. 8C (B. & W.) intravenously in gum scaccia solution		
C. .	21.4.18	Wound of left leg with fracture of tibia	24.4.18	24.4.18	Foreign body removed. Wound excised	B. welchii,	Patient recovered
				27.4.18	Flush amputation. 10 c.c. anti-gas serum 19 G A (B. & W.).	B. sporogenes and B. tetani	
				Wounds of Shoulder.			
E. H. T.	15.4.18	Wound of arm and left shoulder, no fracture	17.4.18	17.4.18	Excision of portions of deltoid and trapezius. 20 c.c. of anti-gas gangrene serum 3 G. C. (B. & W.). Intravenously in gum scaccia solution	B. welchii, B. sporogenes and B. tetani	"
W. . .	23.4.18	Wound of left shoulder, compound fracture of scapula	25.4.18	25.4.18	Fragments of scapula removed and wound excised	B. welchii, B. tertius and B. sporogenes	"
				26.4.18	10 c.c. anti-gas serum V.W.G. 19A.		
				27th, 28th, 29th ditto			
				Wound of Arm.			
C. W.	28.4.18	Wound of left arm, compound fracture of upper end of humerus	1.5.18	28.4.18	Ligation of left axillary artery and vein	B. welchii ..	Died three hours after operation 1.5.18
				1.5.18	Amputation of left arm on account of gas gangrene. 10 c.c. V.W.G. 19A. Anti-gas gangrene serum (B. & W.)		

TREATED WITH WEINBERG'S SERUM.
Wounds of Thigh.

Initials	Date of wound	Nature of wound	Date of definite signs of gas gangrene	Treatment	Anaerobes cultivated	Remarks
R. F.	27.7.18	Shell wound upper third right thigh	27.7.18 31.7.18	Wound excised. Wound opened up. Foreign body removed	<i>B. welchii</i> ..	Patient recovered
S. W. N.	3.8.18	Right cruro. scruto. ischio. (rectal) lacerated shell wound	6.8.18	Wounds excised. Infected muscles removed	" ..	" "
E. H.	7.8.18	Gunshot wound (thigh), shell wound penetrating popliteal space	19.8.18 18.8.18	Foreign body removed. Incision back of popliteal space. Foreign body, 3 1/2 in., shell removed. Muscles affected dissected out	<i>B. welchii</i> , <i>B. tertius</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. tetani</i>	" "
R. H. P.	8.8.18	Through-and-through wound (thigh)	13.8.18	Posterior group of thigh muscles removed	<i>B. welchii</i> ..	Died 1 hour after operation, 13.8.18
J. S.	8.8.18	Gunshot wound right thigh	10.8.18	Excision of track of wound	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. tetani</i>	Patient recovered
A. H. S.	23.8.18	Through-and-through right thigh	25.8.18	Amputation middle left thigh	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i> and <i>B. tetani</i>	Died 2 hours after operation, 25.8.18
J. S. W.	23.8.18	Shell wound left elbow, rifle bullet wound (thigh)	3.9.18	Muscles excised	<i>B. welchii</i> ..	Died 19.9.18 from streptococcal infection
T. A.	27.8.18	Through-and-through thigh	29.8.18	Muscles excised as far as possible. Addition of patient would admit	<i>B. welchii</i> , <i>B. sporo-</i> <i>genes</i>	Died shortly after operation

R. J. K. ..	2.9.18	Gunshot wound, both thighs, through-and-through both thighs	6.9.18	Excision of affected muscles	50 c.c. .. 5.9.18	<i>B. welchii</i> ..	Patient recovered
B. H. ..	3.9.18		6.9.18	Adductors excised	400 c.c. P. } 5.9.18 20 V.S. } 10 O. }	<i>B. welchii</i> and <i>B. letani</i>	" "
R. W. E. ..	23.9.18	Wounds of head with hernia cerebri; wound of left arm, wound of left thigh	4.10.18	4.10.18 Edematous and gaseous distension of left thigh. Semi-membranous muscle dissected out: a foreign body and pieces of khaki cloth removed from muscle near its insertion	20 c.c. P. } 4.10.18 20 V.S. } 10 O. }	<i>B. tuncifaciens</i> (allied to <i>V.S.</i>) and <i>B. teritus</i>	Died 1 a.m., 6.10.18
B. M. ..	28.10.18	Wound back of both thighs, through-and-through	1.11.18	29.10.18 Partial excision of wounds	50 c.c. Weinberg's serum: 9 a.m. 2.11.18	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. letani</i>	Died 10.30 p.m., 2.11.18
W. H. ..	31.10.18	Wound of right thigh ..	2.11.18	1.11.18 Excision of gangrenous muscle 2.11.18 Dissection of gangrenous muscles 3.11.18 50 c.c. Weinberg's serum 4.11.18 Amputation through thigh	50 c.c. Weinberg's serum: 8.30 p.m. 2.11.18	<i>B. welchii</i> ..	Died 4.11.18, soon after operation
<i>Wounds of Leg and Foot.</i>							
W. A. ..	21.7.18	Gunshot wound of left leg, compound fracture	22.7.18	Leg amputated below knee, 900 c.c. of blood given. Heads of gastrocnemius removed	20 c.c. P. } 5.8.18 20 V.S. }	" "	Died 4.30 p.m., 5.8.18, soon after operation
R. S. ..	8.8.18	Calf of right leg ..	11.8.18	Amputation-upper thigh	50 c.c. .. 11.8.18	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. letani</i>	Died 3 hours after operation, 11.8.18
C. G. ..	11.8.18	Shell wound of right leg ..	14.8.18	Superficial part of muscle removed	20 c.c. <i>welchii</i> } 14.8.18 20 c.c. V.S. }	<i>B. welchii</i> ..	Patient recovered
J. A. ..	23.8.18	Shell wound of left leg ..	23.8.18	Amputation 4 inches below knee	Ditto .. 15.8.18 Ditto .. 16.8.18 50 c.c. .. 23.8.18	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>B. actemittens</i>	" "
R. L. ..	27.8.18	Upper part of right leg ..	30.8.18	Muscle and foreign body removed	50 c.c. .. 30.8.18 50 c.c. .. 31.8.18	<i>B. welchii</i> and <i>B. sporogenes</i>	" "
R. N. ..	30.8.18	Through-and-through wound of right calf	31.8.18	Removal of affected muscle	50 c.c. .. 1.9.18	<i>B. welchii</i> and <i>B. sporogenes</i>	" "

TREATED WITH WEINBERG'S SERUM (continued).

Wounds of Leg and Foot (continued).

Initials	Date of wound	Nature of wound	Date of definite signs of gas gangrene	Treatment	Anaerobes cultivated	Remarks
N. P.	3.9.18	Gunshot wound of right knee	4.9.18	Amputation lower third of thigh 50 c.c. 30 P. 20 V.S. 10 O. .. 4.9.18 } 6.9.18	<i>B. welchii</i> ..	Patient recovered
J. A. H. L.	3.9.18	Wound of left leg ..	5.9.18	Incised. Foreign body not found. Anterior group of muscles affected. Leg amputated below knee 31.9.18 Anterior tibial vessels ligatured 2.11.18 Anterior tibial group of muscles dissected out 50 c.c. Weinberg's serum .. 2.11.18	<i>B. welchii</i> , <i>B. sporogenes</i> and <i>V. septicus</i> <i>B. welchii</i> ..	" "
I. J.	31.9.18	" "	2.10.18	2.10.18 Wound excised. Gas gangrene developed during transport, and right thigh became tympanic. Amputation through lower third of femur at 3 a.m. on 4.10.18. Serum, 50 c.c., consisting of:— 20 c.c. anti-perfringens 10 c.c. anti-cedematiens 20 c.c. anti-vibrio septique injected under skin of chest, and 50 c.c. into skin and muscle of stump in which gas gangrene had recurred 6.10.18 50 c.c. given subcutaneously	<i>B. welchii</i> and <i>B. sporogenes</i>	Died 9.5 a.m., 7.10.18
M. H.	2.10.18	Wound of right calf	3.10.18			" "

<i>Wounds of Shoulder.</i>									
F. H.	..	8.8.18	Gunshot wound right shoulder	10.8.18	Muscles attached to scapula and parts of scapula removed	20 P. 20 V.S. 10 O.	} 10.8.18 .. 12.8.18 .. 11.8.18 .. 12.8.18	<i>B. welchii</i> and <i>B. sporogenes</i>	Patient recovered
W. S.	..	8.8.18	Through-and-through shoulder (right)	10.8.18	Wounds incised freely. Infected muscle removed, especially infrapinnatus	Ditto 50 c.c. 50 c.c.		<i>B. welchii</i> and <i>B. tetani</i>	Patient recovered: had local tetanus
A.T.S. 24,000 units .. 22.8.18									
<i>Wound of Arm.</i>									
B. K.	..	21.8.18	Through-and-through arm (right)	22.8.18	Arm amputated	50 c.c.	.. 22.8.18	<i>B. welchii</i> and <i>B. sporogenes</i>	Died 2.15 p.m., 22.8.18
<i>Wound of Forearm.</i>									
P. G. N.	..	3.9.18	Gunshot elbow	4.9.18	Amputation above joint	50 c.c.	.. 4.9.18	<i>B. welchii</i> , <i>B. sporogenes</i> and (?) <i>B. fallax</i>	Patient recovered

(To be continued.)

MEMORANDA ON THE USE OF HIRED BUILDINGS FOR THE ACCOMMODATION OF TROOPS.

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I.—GENERALLY.

(a) THE principles governing the accommodation of troops in hired and other buildings are set out in detail in the "Quartering Regulations, 1917." Reference is not made in these notes to the organization of the administrative machinery, but it may be noted that each Command in the United Kingdom is divided into areas administered by an Area Quartering Committee with a permanent president.

The Regulations, Chapter III, paragraph 66, state that it is desirable the composition of the Committee should include a sanitary officer. This officer would be, normally, the sanitary officer working under the A.D.M.S. of the medical district within which the Quartering Committee operated.

The term "hirings" is limited to:—

Buildings hired under formal agreement.

Premises taken under the Defence of the Realm Regulations.

The duties of the sanitary officer in relation to these hirings fell naturally into two parts:—

Advisory work before and after acquisition of premises.

Routine inspections after occupation.

With regard to advisory work the most practical method was for the sanitary officer to accompany the president of the quartering committee on his preliminary visit and advise him on the sanitary aspect of the proposals on broad lines—such as local conditions as regards conservancy arrangements and bathing facilities—the possibility of a suitable and well-placed central mess—and the provision of sleeping and storage accommodation. When the scheme had progressed a full list of the hirings was sent to the sanitary officer with a view to detailed recommendations as to the suitability of the various hirings from a sanitary point of view.

With regard to supervisory work after acquisition, it was found that owing to military exigencies troops often occupied hirings before the Royal Engineer services were completed. An early visit was, therefore, found necessary so that the sanitary officer could get in touch with the incoming unit, and, in conjunction with the officer commanding, the medical officer in charge, and the Royal Engineers, assist in the early establishment of satisfactory conditions. When the Royal Engineers' services were completed, sanitary inspection became a simpler matter, although work of this

character amongst troops in hired buildings differs from that in hutment camps in that improvements constantly suggest themselves as the unit settles down in its quarters, owing largely to the improvised character of the accommodation.

In both aspects of the work given above important questions and points involving principle were dealt with by reports to the A.D.M.S. for such action as he thought desirable with the unit concerned, the C.R.E. or the president of the quartering committee.

(b) It was found a matter of great importance for the sanitary officer to be in close touch with the Royal Engineers, as so much could be done to promote the comfort and health of the troops if cordial co-operation was initiated at the earliest stages, and maintained throughout the progress, of a quartering scheme.

The importance of the Royal Engineers' services in relation to the well-being of troops need not be elaborated, but notes on the sanitary aspect of the use of hirings for military purposes would be incomplete without reference to the ingenuity and resource shown by the Royal Engineers in their work of adapting hirings and the erection of auxiliary structures in connexion with them. Full consideration was given by the Royal Engineers to recommendations affecting the sanitary conditions and many improvements were initiated, and given effect to, by them.

(c) The quartering of troops in hirings, more especially when large numbers were involved, presented special difficulties and called for vigilance on the part of all concerned. Additional responsibility was thrown on the officer commanding if a satisfactory standard of sanitary efficiency was to be maintained. Houses, situated singly or in small groups, in a more or less scattered manner amongst a civilian population, offer a great contrast to the compact areas formed by barracks, hutments or canvas camps. The general sanitary condition of a hutment camp can be readily envisaged. The cleanliness and state of ventilation, for instance, of two huts where sixty men sleep can be much more rapidly appreciated than one hiring accommodating an equal number of men, divided into storeys and having a number of relatively small rooms.

It was, at times, necessary to urge the importance of daily visits by an officer to every part of the hirings. This is an onerous task where the area and number of hirings is large and the work has to be done on foot. Unless it is done, however, unsatisfactory conditions can quickly arise. Latrines and ablution places can become in a bad state, gullies be stopped up with refuse, rubbish can collect in cellars, outside areas and the cupboards of rooms and passages. Overcrowding and lack of proper ventilation may occur in individual rooms unless a close watch is kept.

There was again the interests and reasonable wishes of the civil population. Little friction, however, was noted in this respect provided care was exercised in the disposition of outside latrines and ablution places and the co-operation of the medical officer of health and local surveyor was sought at an early stage.

II.—CENTRAL MESSING (Quarterming Regulations, 1917, para. 73 a).

(a) The selection of a hiring for this purpose was considered a matter of especial importance in relation to the health and comfort of the troops. The aim was to secure accommodation that, with a minimum of Royal Engineer services in adaptation or new structures, would give facilities for the efficient preparation of food and its prompt and easy distribution, whilst still hot, in a dining-room where adequate air and floor space, ventilation, and heating could be obtained. An important factor was its accessibility from sleeping and other quarters of the troops using it.

One mile was taken as the extreme limit of distance for the hirings most remote from it; apart from economy of time many of the troops were of low category.

As a general rule most of the hirings would, however, lie within a half mile radius of the mess.

Eastern Command Order No. 1428 of July 6, 1918, states that, "separate dining accommodation should normally be provided for two-thirds of the total numbers at 6ft. per man." In practice two sittings were usually found necessary.

(b) The accommodation acquired varied occasionally and included:—

Public and drill halls	} For large messes.
Swimming baths	...	...
Race course buildings	...	...
Groups of shops	...	...
Large houses	...	...
Village and small halls	} For serjeants' and other small messes.
Cinema halls	...	...
Groups of stable buildings	...	...
Sheds and outbuildings	...	...
Moderate sized houses	...	...

For large messes the public and other large halls were found the most suitable. They are generally centrally placed and in good condition; the dining accommodation in the main hall is usually adequate and adjoining compartments can often be adapted for cookhouses, washups, and food storage: if new structures are required open space adjoining is usually available. In the case of swimming baths the Local Authorities have often a floor ready to place over the bath. The other buildings noted have all been found capable of providing reasonably good accommodation—as a unit consolidates its position improvements suggest themselves, and if effect be given to these central messes fulfilling the primary sanitary requirements are the result.

(c) The extent of Royal Engineers' services necessarily varied—in some instances all the essentials of a central mess were present—such as in houses for the use of serjeants or small detachments—in others cook-

houses, washups, and food stores had to be built. After acquisition it was found desirable, whenever practicable, for the sanitary officer to meet the D.O.R.E. and an officer of the unit at the building and settle details. The general disposition of new structures and adaptation of existing ones, improvement of lighting and ventilation, the means of drainage, the suitability of existing floor surfaces, the question of sleeping accommodation for the cooking staff near their work and the relation of the cookhouse and mess to adjoining buildings in civil occupation all came within the purview of the sanitary service.

A general survey of surrounding properties was found essential with a view to the elimination or modification of conditions liable to operate unfavourably, e.g., in one case the removal of horses stabled close by, with unsatisfactory conditions as regards the disposal of manure, was effected with the co-operation of the Local Medical Officer of Health.

It was found desirable to arrange for a group of latrines near at hand for the use of the troops and for ablution arrangements for the cooking staff. If the latter is not provided the misuse of sinks where food is prepared inevitably follows.

Paved areas for swill and refuse bins and grease traps were provided; the provision of the latter, apart from fat saving, was found desirable to prevent the stoppage of drains.

(d) One example may be cited of the work carried out to improve sanitary conditions in a somewhat unpromising hiring for a large mess. The unit moved into the area in 1918 when suitable halls had already been taken for housing furniture (largely stored by men serving with the Forces). The premises acquired were a group of suburban shops thrown together as the original business expanded. In the immediate rear was a group of dilapidated sheds in a somewhat confined area, but having the advantage of a separate approach from a side street. The shops were allotted as dining accommodation for about 1,000 men in two sittings, the sheds at back for cookhouses and ancillary structures. The plate glass windows of the shops, running from floor to ceiling without openings, invited damage and militated against efficient ventilation. They were removed and stored for re-use, the space thus left was filled in the lower part with coke breeze concrete slabs, in the upper part with ventilation louvres and windows centre hung to open. Stoves were placed and connected to existing flues. The main shed in the rear, originally a stable with loft over it, was adapted as a cookhouse by removing the loft floor (thus opening up the interior), enlarging the existing windows, providing ventilation at the apex of roof, laying a concrete floor inside and paved space outside connected to a gully, and cleaning and limewashing the walls. The smaller sheds were adapted for washup, vegetable preparation, etc. A minor improvement made here was the elevation of the farm boilers (for supplying hot water in washups) to a sufficient height to allow of pipes being carried from them to supply water to sinks by gravitation. Food storage was

temporarily arranged in a portion of the basement under shop with a new ventilation shaft, pending erection of permanent food stores in yard. The sinks from cookhouse, washup and vegetable preparation room were taken into one water-cooled grease trap connected to existing drainage.

Those portions of the shops not required for dining accommodation were partitioned off for quartermaster's stores, the rooms over shops were adapted as a serjeants' mess and sleeping accommodation for the cook-house staff, etc.

III.—LIVING ACCOMMODATION.

Some principles governing the selection of this accommodation are laid down in paras. 69 to 78 of the Quartering Regulations, 1917. They are amplified by Eastern Order, No. 1,428 of July 6, 1918.

The premises acquired again varied greatly in character—ranging from a training college to race-course buildings, from country houses to shop premises. The bulk of the accommodation, however, was large and medium sized houses. So far as possible it was found desirable for all hirings to be inspected by the sanitary officer. In the later stages of the war the difficulties experienced in obtaining suitable premises in the outlying suburbs and environs of London increased. The factors were the cessation of normal building operations and the removal of certain elements of the civil population from the central areas to outlying districts to escape air raids. The class of property left available needed close attention before occupation. It was found necessary in many cases for the sanitary officer to definitely advise against acquisition. Saturated walls, defective drainage and water supply, and the presence of dry rot were often noted. Whilst the majority of such structures *can* be rendered suitable for military occupation the expense incurred by the necessary Royal Engineers' services often negated the advantage of cheap acquisition. Hirings for living accommodation may be conveniently considered by division into (a) sleeping; (b) ablution; (c) latrine accommodation; and (d) water supply.

(a) *Sleeping Accommodation.*

Generally.—The condition of walls as regards dryness, the suitability of flooring and the adequacy of the means of ventilation were the principal points borne in mind. Others were the elimination of dust and dirt collecting surfaces, such as loose paper and plastering, old oilcloth on floors and defective venetian blinds and woodwork. Dampness was dealt with by ordinary Royal Engineers' services (such as unstopping gutters) and by the use of fires in rooms before occupation. Ventilation could often be materially improved by making fixed windows to open, removing panels from doors and, in a few bad cases, forming ventilation shafts. Units were often able to supply troop labour for cleaning and distempering walls; the materials and supervision being provided by the Royal

Engineers. Washing down and disinfecting wall surfaces was necessary at times. Quarters in such places as racecourse buildings and rooms over disused stabling needed close attention. An apartment well lit and ventilated over a portion of its area might be unsuitable for sleeping purposes in the remainder. The ordinary fixed skylights in lofts following the line of the roof could be made into a good ventilating dormer by hinging it at the top end, raising it up and providing louvre boards at the sides and front.

Basements.—These were not used for sleeping purposes—owing to shortage of accommodation it was, however, necessary at times to occupy rooms partly in the ground. In such cases the height of ceiling and windows above the external ground level, the width of the outside area and the possibility of foul air from the floor were considered before the rooms were allotted.

Routine inspections showed the necessity of impressing on units the importance of cleaning out unused cellars immediately below sleeping rooms. Accumulations of rubbish were often left or deposited in such places, and there was the danger of vitiated air arising through the floor boards.

Attics.—It was noted the ventilation of these rooms was conspicuously defective; where it was necessary to occupy them it was dealt with by providing additional facilities or by reducing the number of men to the estimated extent of the available ventilation and *not* basing the accommodation on cubic space or floor areas.

Schedules of Accommodation.—A point always insisted upon, when troops came into occupation, was the preparation of labels for fixing to the doors of each sleeping room stating clearly cubic space, floor area and number of men to be accommodated. The tendency to overcrowding in excess of the forty square feet and four hundred cubic feet per man is always liable to arise. Even when the *total* sleeping capacity of a hiring is not exceeded N.C.O.s i/c may crowd one room and leave others not fully occupied.

Refuse Disposal.—This is usually effected by the Local Authority. In some cases, however, the units supplied the men, the Local Authority providing carts and horses.

It was found desirable on routine inspections after occupation to make a point of examining unlikely places. Men on special duties, such as the cooking staff, batmen, &c., often have been found occupying unofficial sleeping quarters, and these are usually dark and ill-ventilated. Church and village halls, at times used for sleeping purposes, are liable to have the benches and chairs stored at the stage end. It was found necessary to have these removed and stored elsewhere, otherwise an area was formed that could not be kept clean and free from dust.

(b) Ablution Accommodation.

In small hirings for twenty to forty men, a bench was usually fitted up in the scullery to drain into the sink. A scullery has the advantage of being a room that is usually paved with impermeable material, such as tiles or concrete. In larger hirings, unless a very large paved scullery or conservatory was available, the ablution bench was usually arranged outside—either in paved outbuildings, such as stabling or garage, or by the erection of a shelter having a concreted floor, a bench and connexion to the draining system. It was found desirable wherever possible to allow of no ablution bench in a room having a wooden floor. After a period of military occupation the floor and the surface beneath becomes sodden with water and dirty saponaceous matter.

A large conservatory often made a good ablution place. Water supply, means of drainage, and a paved floor were usually available, and the existing benches could be utilized. The removal of any earth beds on the floor, was, however, necessary, as dirty water was liable to be thrown about.

(c) Latrine Accommodation.

With a few exceptions, such as racecourse buildings, the existing latrine accommodation in hirings accommodating over fifty men was inadequate.

The six per cent basis was interpreted as including groups of latrines erected near gathering points such as the central mess.

Where a hiring accommodated less than fifty men the existing arrangements—usually two or three w.c.s—were utilized. In many cases where tiles or concreted floor and pedestal closet were present nothing was necessary except ordinary supervision. In other cases, the older type with a pan entirely enclosed with woodwork and having a boarded floor, it was found they were the subject of progressive deterioration; seats, enclosure and floor becoming in a most insanitary condition. In such cases the following work was advised—the removal of all superfluous woodwork, the provision of an impermeable coating to the floor and the benching up of the pan in concrete. Where hirings accommodated over fifty men a range of latrines was erected in the garden or suitable outbuildings. As hirings are often placed in proximity to buildings in civil occupation care was necessary as to the position of the latrines and screening them from observation.

Hirings are often acquired in a group of three or four houses; in such cases it was found best to erect one group of ablution places and latrines to serve them all: the division walls or fences of gardens having openings formed for access. The latrines constructed were of a simple water carriage nature, having a concrete floor, enclosure and a roof, an automatic cistern flushing a trough pattern latrine with seats, and a urinal space.

The work was simplified in the great majority of cases by the existence

of a public drainage system (the few large houses in outlying districts where this did not exist were specially dealt with). Recourse was made to pail closets (with seats and an enclosure and roof) in a few instances. This method was adopted as a temporary measure only, owing to shortage of material or labour or where difficulty was experienced in obtaining definite information as to the duration of stay of a unit in the hirings. It was found that if there was close supervision as regards cleanliness, if care was exercised in the disposal of excreta and if measures were taken in regard to flies, pail closets could be used for a time without causing annoyance or friction. The buildings being connected to the drainage system, a covered manhole or inspection chamber in the garden of the hiring was used for emptying the contents of the pail into the drain. It was necessary to secure adequate flushing of manhole and drain after each use and to approach the officials of the local authority concerned before adopting this temporary measure.

(d) Water Supply, etc.

This question was greatly simplified in the area under consideration by the fact that practically all the hirings had a water supply laid on, and obtained from the public main. In a few cases where accommodation was sought for outlying detachments and a well supply only was available, action was taken as laid down in the Regulations for the Army Medical Service. Efforts were made to secure water for drinking purposes being taken directly off the rising main and not drawn from the cisterns, suitable cocks being labelled for this purpose. Disused cisterns, receptacles for water in gardens and other likely places were watched and treated with a view to preventing the breeding of mosquitoes.

IV.—BATHING.

The normal arrangement for the troops to obtain hot baths was the utilization of the provision made for the public in this respect. Public baths were within reach of most units, either by marching, or transport in trams or lorries. All that was necessary in this case was the arrangement with the local authorities of bathing parades at suitable times. Authorities were found willing, when the numbers were sufficient to warrant it, to set aside days, or parts of days, for the use of the baths by troops only and in one case the public baths were wholly acquired for military use.

Use was made of both slipper and swimming baths; when large numbers were present the slipper baths were supplemented by tubs in the cubicles.

For men on special duties—cooking and office staffs—who could not parade at the usual hours, use was made of the ordinary baths fitted in the hirings. This method was considered auxiliary only owing to difficulties in supervision and in obtaining sufficient fuel. Cases arose where the methods previously indicated were not practicable. In such instances

suitable outbuildings, stabling, or a garage attached to a centrally-placed hiring, were adapted. Paved flooring, water supply and a drainage system already existed and the necessary work included fixing a boiler, piping and the division of the selected area into cubicles by light partitions and the fixing of concrete curbs of the usual camp type.

In units of a nature where men were constantly coming and going, the organization of bathing parades is arranged with some difficulty, and it was found desirable for the sanitary officer to bear this in mind on routine visits and impress on those concerned the importance of a weekly hot bath and change of underclothing for each man.

V.—DISINFECTION.

The control of infectious disease and the disinfection of quarters do not call for special comment in the case of hirings. No difficulties were noted in applying the usual principles in such cases. The disinfection and disinfestation of blankets, clothing, etc., was dealt with in three ways.

- (1) By arrangement with the local authority.
- (2) By the use of existing provisions at adjoining standing camps, barracks or hospitals.
- (3) By the provision of "Thresh" disinfectors or the erection of a steam disinfecting chamber.

The locality of the station and the number of men present varied so much that each of the arrangements given above was found to have points of advantage in certain cases.

Wherever the number of troops is large enough, however, it is undoubtedly desirable for units to have their own means of disinfection and disinfestation. When articles are sent to the local authority the question of cost arises and when sent to adjoining military establishments difficulties are apt to arise in speedily arranging for transport and suitable hours for disinfection on a large scale.

A note may be made of the arrangements at Sutton:—

The public baths were acquired wholly for the troops and were in use by the Eastern Command Labour Centre and also for a time by the Eastern Command Discharge Centre. In both these units men were constantly coming and going and blankets were handed on from one man to another.

A steam chamber, on the lines of the "Grant" hut, and capable of dealing with 200 blankets per hour, was erected in a yard adjoining the boiler house of the baths from which an ample supply of steam was available.

In addition to the treatment of infected articles a system for the routine disinfestation of all blankets in use was initiated—the aim being to secure that each blanket was passed through the chamber once a fortnight.

As the number of troops was considerable and occupied hirings in all

parts of Sutton and the outlying districts, transport was found necessary for the blankets, and a lorry was ultimately secured.

A reduction in the incidence of scabies was noted after the method had been in force for a little time and although other causes doubtless operated the system adopted was believed to be one of the factors.

At these baths a Scabies Treatment Centre was also placed to serve troops in the district and at Croydon, Purley, Redhill, and Reigate if necessary. A group of the slipper baths having a w.c. and dressing rooms immediately adjoining (the whole capable of separation from the rest of the building) was set aside for the purpose, the disinfecting chamber being near at hand for the treatment of clothing. A small hiring was allotted for the living accommodation of the patients; their food was brought from the central mess and means of warming it up were provided.

VI.—OFFICES, STORES AND REPAIR SHOPS.

(a) *Offices.*—The provision of orderly rooms and company offices did not present special difficulties, the larger rooms of dwelling houses being well adapted for the purpose. At racecourses, training colleges and in large shop premises suitable portions of the structures were found available and little alteration was needed. In all cases the imperative necessity of securing ample ventilation was found to be the important point: men engaged on clerical work at such offices worked long hours and there was also a tendency to overcrowd the rooms.

(b) *Stores.*—In large units the quartermaster's stores needed close attention if satisfactory conditions were to obtain. At times the accommodation was necessarily somewhat scattered, but when the storage of meat, bread, groceries, equipment, clothing, bedding, blankets and fuel were grouped together alterations to the premises acquired were found essential. Separate bread, meat and grocery stores were arranged by the adaptation of existing buildings or sheds. In some cases portions of buildings were found fulfilling practically all the requirements and needing only fly-proof wire over the openings—in others, such as a large shed with a galvanized iron or other light form of roofing, it was necessary to partition off into compartments and provide a ceiling and cross ventilation to them to secure the necessary reduction of temperature during the hot weather. This was of special importance where meat was drawn three times a week only.

Suitability of flooring, both as regards the surface and facilities for washing out, needed attention and also the condition of the yard space outside used by lorries and other transport for drawing and issuing supplies.

The importance of a well-paved surface to the yard of a quartermaster's stores is obvious if mud in the wet, and dust in the dry, weather is to be avoided in the compartments opening from it.

Small coach-houses and similar outbuildings often gave good food storage room—the paved floor, however, was sometimes drained into a

gully *within* the structure, which was connected to a drainage system. To prevent the possibility of contamination of food supplies, these gullies were disconnected and sealed off, arrangements being made to get rid of water used in washing down floor, on the outside.

Dryness and good ventilation were aimed at in the accommodation for storing clothing, bedding and blankets. Fuel storage was placed as far away as practicable from bread and meat stores on account of the dust generated in loading up handcarts for supplying fuel to the hirings.

The small stores of company offices, where blankets and palliasses were kept for direct issue to men were examined on routine visits: at times there was a lack of care in the storage of these and they were found placed by open windows where rain could drive in, or kept in damp basements. The most convenient place is an airy room where they can be placed against inside walls.

(c) *Repair Shops*.—Provision was necessary in the larger units, for tailoring and boot repairs. Good light being essential in both cases ordinary shop premises could be made suitable.

The shop forms a good working area, and rooms at the back can be used for storing boots and clothing awaiting repairs. The great defect of nearly all shop premises, however, is inadequate ventilation. The glass front often runs from sill to ceiling without opening; or where a ventilation panel at the top is provided it is too small to allow of the necessary change of air; in addition the rooms behind usually open into a confined yard. Much could be done to promote good cross ventilation by making fixed lights to open and forming fanlights over the doors. The aspect of the shop needed attention; in the summer months, if an outside blind was not provided in certain cases, the conditions for men working behind an unscreened area of plate glass became most unsatisfactory.

VII.—OFFICERS' QUARTERS.

Two broad considerations were presented when the acquisition and adaptation of quarters for officers was undertaken.

It was obviously desirable the accommodation should approximate, on simple lines, to the standard of comfort and refinement that obtained in other messes of a more settled character. The influence of environment on young officers, newly commissioned, and also on cadets, was an aspect of the case often brought forward by officers commanding. Efforts were accordingly directed to securing quarters well situated and in good order, and to improving the general conditions, where necessary, by cleaning and distempering walls and providing facilities for bathing within the hiring. The second consideration was the proximity of the mess to the headquarters. In small units as a matter of convenience the orderly room and officers' mess were often grouped in the same hiring, and in any case, a house or other building was acquired within easy distance.

(a) *Messes*.—These were generally arranged in large houses where two or three rooms of good size were available for dining and anterooms. The kitchens, sculleries, larders and pantries were usually sufficient to meet the requirements, although it was often necessary to supplement the kitchen range with a gas stove, to improve the ventilation of larders and provide fly-proof wire.

In one instance, where the number of officers was at times very large, a Masonic hall was acquired for their use. This building had all the essentials, and many of the amenities, of an officers' mess. Dining and anterooms, ample lavatory and latrine accommodation and good facilities for cooking were available. A few improvements were effected to extend the provision for washing up and secure the better storage of food. At one of the racecourses, again, good accommodation was found, although in this case sufficient anteroom space was not available and extension was necessary.

(b) *Sleeping Quarters*.—Where the mess was in a house, the bedrooms in the same building were used. Additional rooms were often necessary, however, and it was found a convenient course to set aside a hiring, especially for officers, their batmen having quarters in the same building. Many units detail a room for an officer for each of the large hirings occupied by men, with a view to more effective supervision. Even in the case of officers there is a tendency at times towards the overcrowding of sleeping rooms. Units training officers for overseas duties were especially liable to have their strength increased at short notice, and it was important to arrange for some reserve accommodation to meet a rush.

These notes have reference to the Woolwich medical district only. In this district the number of troops accommodated in hirings alone was at one time considerable and reached about 48,000.

So far as the area in which the writer worked was concerned a review of the conditions leads to the conclusion that a very large variety of buildings, ordinarily in civil use, were capable of adaptation for military occupation, and that troops in large numbers, and often of low medical category, could be accommodated in them without detriment to health, provided care was exercised in the selection of the hirings, that the Royal Engineers' services were adequate, and that an efficient sanitary standard was continuously maintained.

Permission was kindly given by the A.D.M.S., Colonel H. V. Prynne, D.S.O., for the preparation of these notes.

Until April, 1919, the Specialists Sanitary Officer responsible for the whole district to the A.D.M.S. was Lieutenant-Colonel A. Butler-Harris, R.A.M.C., with whom the writer was fortunate to be associated, as Assistant Sanitary Officer, for fifteen months.

Clinical and other Notes.

CANVAS DESTROYING FUNGI AND THEIR INVESTIGATION IN MALTA AND ITALY.

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THE rot or pique of cotton and linen canvas has been observed for many years, and various measures to prevent it have been employed, especially by yachtsmen and fishermen. It is well known to them that if they put their sails away wet, moulds soon grow upon them and destroy them; while the sails stained brown by cutch as a means of preventing this growth are familiar sights in all fishing ports. The mildewing of manufactured cotton and linen fabrics is a condition of great commercial interest, but while not entering into the particular scope of this article, a study thereof is not irrelevant to it, and the observation published by Osborne [3] among others is very interesting.

The work with which this article deals followed upon the instructions received from Major-General Sir M. T. Yarr, D.D.M.S. Malta Command. It bears in the main upon the rot found in the canvas pitched in hospitals and convalescent camps of tents in Malta. In the latter part of 1916 much tentage was employed, and attention called to their rapid spotting and destruction. Under supervision of Colonel Purchas, D.O.S., and with the collaboration of Major F. H. Phillips, A.D.O.S., an investigation was undertaken, the results of which follow.

Pursuing the history of canvas rot in Malta, it was learnt that the Navy have had this trouble for years. The Admiralty submitted samples of the awnings (unaffected) to a firm of textile experts, who reported that the material was of good quality, and conformed with specification, also that no increase of life could be expected even if higher-grade quality were provided. Their conclusion was that the deterioration was due to (1) exceptional exposure, or (2) climatic conditions at Malta. Awnings in Malta last about one year.

Considering the importance of the subject and the time we have known of this rot, it is surprising how limited has been our scientific work upon it, and, consequently how scarce our knowledge and restricted our methods for dealing with it.

Of earlier workers the observations given in the book by Buchanan, and that by Lafar, are very instructive. More recently this canvas destruction has become one of particular importance, since untreated canvas of tents, marquees, etc., has been rapidly rendered unserviceable by the growth of moulds.

During a discussion with Professor Pinczy at the Pasteur Institute, Paris, he very kindly detailed the results of his investigation into the conditions found, and described the lines of preventive measures which have proved satisfactory.

Guegen [1], another French worker, reports his findings that the fungi on damaged tent canvas were chiefly *Pleospora infectoria*, generally in the conidial stage (referred to by him as *Alternaria tenuis*); and *P. herbarum*, also generally in the conidial stage, and *Macrosporium commune*. Other moulds such as Rhizo-

cladium and Helminthosporium were occasionally present. He found the mycelium of the fungi growing, not only along the surface of the fibres but in the lumen of the cells, and came to the conclusion that the fungi had been present in the fibres before they were woven into cloth and developed when conditions were favourable.

Ramsbottom [2], on examining damaged canvas, found also that the perfect fruiting from Pleospora was of rare occurrence, but Alternaria and Macrosporium were abundant, while Cladosporium, especially Stachybotrys, Helminthosporium, etc., were more or less frequent.

From microscopic and cultural examinations of damaged canvas carried out in Malta, and in part repeated and extended with the collaboration of Miss Lorrain Smith, of the Botanical Department, Natural History Museum, in London, the conclusions arrived at were that the principal agents of destruction of cotton and flax-made canvas are fungi of the genus Macrosporium and of the genus Stemphylium. This latter is closely allied to the former, and probably also represents a stage in the development of some higher fruiting form, such as Pleospora, but the connexion has not yet been demonstrated.

From the evidence of investigators canvas is affected by Macrosporium in many countries. In Malta it is the Stemphylium which relatively is more prevalent, and which could be very readily isolated from canvas, and also by exposing plates of culture media to the air. It was present in the spots examined, including those found in canvas made in Malta from locally grown cotton, and set up on a windmill there.

The spotting of canvas and its limitation is due to centrifugal growth from infection centres, and is a characteristic of the fungi. The characteristic colour of the Stemphylium on culture, as in canvas, is initially brown, then becoming black, and the blacker the spot the more advanced is the development of the fungus and the greater the destruction of canvas. Though many of the spots were diamond-shaped, and a good proportion of these when examined proved to contain an almost pure growth of Stemphylium, the shape was not consistent enough to be considered characteristic. The variation in the colour of the spots, especially noticed in the flax-made and more resistant canvas was found due to the association with the Stemphylium of Macrosporium or Stemphylium plus Macrosporium or other of the lower forms of vegetation, which have been seen on direct microscopic examination, cultivated and classified as Septoria, *A. tenuis*, Helminthosporium, Chætomium, Exosporium, Penicillium, Oöspora, Torula, Saccharomyces, and pigment, especially yellow forming, and other air-borne bacilli. Certain of these may, and probably did, assist in the work of destruction, but no proof was obtained that canvas was destroyed without the presence of Stemphylium or Macrosporium.

Moisture is necessary for the cultivation of these organisms. Growth takes place readily on Sabouraud's and ordinary agar media. To reproduce growths on specimen sterilized canvas, the most practical method found was to take a few infected fibres and tease them out on the new canvas lying in a small sterile Petri dish and kept moist. The Stemphylium and the Macrosporium grew readily when kept in the laboratory or exposed without, and, apparently, over a wide range of temperature.

The temperature and humidity at Malta are very favourable for the growth of

the organisms on canvas. The optimum time period is from October to April or May, when rain falls intermittently, and there is warmth and moisture, and what appears also favourable, moderate sun-rays.

The first signs of fungoid growth on canvas appear on the inner side of the roof portions of the tents and marquees. When these are double, it is the outer canvas most early affected, and not infrequently the only one of the two linings to be affected. At the onset there are small spots greyish to black in colour and showing outstanding hyphæ. Later, the colour deepens with the growth, and varies from grey to brown or black, yellow to dark orange, or rose to red. The two latter groups of colours are due to associated organisms, and are especially seen in flax-made canvas, wherein the fungoid growth is slower than in cotton-made canvas. These spots, while extending, become irregularly ovoid, diamond or rounded in shape; and, as the growth is in the canvas itself, can be early seen from the outside also. The growth and consequent destruction is rapid, and very often within three months pressure on these spots leads to perforation, or a strong wind causes tearing. The single-lined Y.M.C.A. tents, in which many men gather, became most readily covered with fungoid growth, and were destroyed. The favourable influence of the sun's direct rays was apparent from the comparatively small number of spots behind door flaps and other shaded portions.

Microscopic examinations showed the proliferation of mycelium, first without, then within, the lumen of the cells.

Old samples of retted flax fibre from Russia and India, as also fibres of hemp and jute and of Soudan cotton, were obtained from the Imperial Institute. The presence of fungi was easily demonstrated on the flax fibres, dark brown hyphæ covering any scrap of cortical tissue still adhering to the strands, and also travelling along the clean fibres. A large brown spore—*Macrosporium* or *Stemphylium*—and a *Cladosporium* were noticed on water-retted Russian flax, but fructifications were practically absent. As the material was old, these fungi did not grow. No trace of a fungus was found in the cotton sample.

Brigadier-General Seymour, C.B., A.D.O.S., kindly supplied several specimens of cotton and linen duck canvas ready for tent making. The flax-containing material showed the fibres in good condition, but brown mycelium was found more or less in abundance. In one instance the mycelium on the fibre gave rise to the *Stemphylium* fungus. A large *Macrosporium* spore was also found entangled in the fibres as well as brown septate spores like those of *Cladosporium*. Bacteria were abundant in all cultures, and also *Saccharomyces*, *Oöspora*, and other common moulds. Probably the fungus reaches and begins growth during the retting of the flax, though it may be present on the growing plant. New cotton-made canvas appeared free from Mycelium, and this is not surprising when its method of preparation is studied.

Experiments upon the treated canvas showed the Willesden (cuproammonium) method and cutch treatment prevented the growth of *Stemphylium* and *Macrosporium*. Mango-treated canvas was in no way inhibitive. Treatment by Piney's method (soft soap 1 in 5,000 solution, followed by a mixture of one per cent alum and one per cent copper sulphate) greatly inhibits their growth, and its extended employment in Malta gave very satisfactory results, and encouraged further work on the method. A means of supplying a current of air through the upper portion of tents and marquees is suggested as an additional preventive measure.

Since the writing of the above, opportunity presented itself for investigating the canvas growths in tents and marquees pitched in and around Gehoa and Bordighera, Italy. The Stemphylium and Macrosporium were again found in all infected portions of the canvas, while the associated organisms resembled in the main those found in Malta. Of these latter the *A. tenuis* was the most prevalent. Treatment was again applied.

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A NOTE ON NERVE SURGERY AND ITS RESULTS.

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AND

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DURING last year 6,636 patients were treated at the Electrotherapy and Massage Department of Summerdown Camp, Eastbourne. The busiest period followed the admissions in May of the casualties sustained in the March "push." The list in that month rose to 1,726, and for twelve weeks afterwards the number of daily treatments averaged over 850. This volume of work was only rendered possible by the enthusiastic spirit shown by Miss C. M. Young (Head Masseuse) and her thirty-nine assistants of the A.P.M.M.C. No praise is too great for them, and we wish to place on record our appreciation of their fine example at this time.

Neither could the numbers have been dealt with without the system, adopted from the foundation of the Department by Colonel J. S. Bostock, of including all kinds of treatment in each ward. It was thus possible for a masseuse to supervise efficiently as many as five cases at the same time; for example, one man might be in a radiant heat bath, a second having electrolysis, a third interrupted and reversed Faradism, a fourth stimulating his own muscles by a low-tension portable coil, and the fifth receiving actual massage. This system besides being economical in time and cost, also makes for the happiness of patients, who find interest in the company of their fellows and avoid the monotony of a solitary treatment hour.

The number of cases of serious injury to peripheral nerves is shown in the following table. It may be remarked that all instances of minor contusions are omitted, only those being counted in which distinct changes due to nerve block were evident, and in which treatment of muscles was indicated. We have also omitted a few cases of facial, sp. accessory, scapular, and long thoracic paralysis.

	After operation	Not requiring operation	Found to require and sent for operation	Total
Brachial plexus	4	19	8	26
Circumflex	—	5	3	8
Musculo-spiral	14	16	12	42
Posterior interosseous	1	19	7	27
Median	20	46	29	95
Ulnar	32	44	66	142
Median plus ulnar	10	7	13	30
Anterior crural	1	3	0	4
Sciatic	12	14	3	29
Internal popliteal	—	9	0	9
Posterior tibial	4	8	7	19
External popliteal	8	46	11	65
	106	236	154	496

These figures differ from those usually accepted as applying to the relative liability of individual nerves to injury, the explanation being that, as a convalescent hospital we received only selected patients who were beyond a bed-ridden stage and able to attend to themselves as regards ordinary functions of life. One fact however stands out—namely, the preponderance of ulnar over median injury in wounds of the forearm.

But although our selection of cases was thus modified to some degree, it will be readily understood that by this time we had got far away from the original purpose of a convalescent camp. The number of main nerve injuries discovered here and sent out for operation is significant of the class of injury sent to us. We were no longer bound down to a narrow time limit; we received nerve cases, for instance, immediately after operation and treated them until they reached the safety line. It has been an extraordinary experience. Before the war one rarely had the opportunity of following the progress of a nerve repair; in Summerdown a casual census one day showed no less than 175 cases of nerve injury either waiting operation or in various stages of recovery.

Chief interest centres in those cases in which the diagnosis of the injury to the nerve was made with us, and in which operation was carried out by Captain Home at the Central Military Hospital. We not only had the satisfaction of confirming the diagnosis, but we were also enabled to see the after effects of treatment. Details of these cases are furnished by Captain Home as follows:—

From the end of 1916 to May, 1919, sixty-nine cases of nerve operation have been undertaken at the Central Military Hospital, Eastbourne, but records of the seven earliest cases are incomplete. The remaining sixty-two operations were done in the period from October 11, 1917, to April 23, 1919, and properly come within the scope of Captain Kellett Smith's survey, as having in every case but one been the subjects of massage in his department before operation. The sole exception is that of a repatriated prisoner from Germany who had been demobilized, and who on presenting himself to have his A.F.Z.22 completed was discovered to have ulnar nerve palsy after gun-shot wound of forearm. His operation revealed complete division of the nerve. Resection of bulbs and suture were performed, and he has now come under treatment of the massage department during his regeneration period.

To deal therefore with the remaining sixty-one cases of nerve operation—they concern fifty-nine individuals, as in two cases the individual had two operations at different dates.

The injuries were as follows :—

Ulnar	31
Median	15
Musculo-spiral	1
Posterior interosseous	4
Sciatic	3
Median and ulnar	4
Median, sciatic and musculo-spiral	1
	<hr/>
	59 (65 nerves)

As one ulnar nerve was divided in two places, i.e., both main trunk and dorsal branch, this makes a total of sixty-six nerves injured. As regards these sixty-six nerves, it was found that the injuries were :—

Nerve strangled	15
„ partly divided	10
„ completely divided	41
	<hr/>
	66

The interesting facts that so far emerge are therefore not only the extraordinary frequency of ulnar nerve injury as compared with other nerves, but also the much greater frequency of complete division.

Of these fifty-nine cases, sixteen have been operated upon so recently that it is too early to give any account of their progress.

Of the remaining forty-three cases the results may be tabulated as follows :—

Definite evidence of restoration of nerve function	40
Transferred to other hospitals	2
Invalided from Service to receive massage elsewhere	1

Of the cases transferred one will be referred to later as a case of nerve bridging. The other case was admitted for operation on account of intense pain—exploration of the ulnar nerve revealed that the nerve was fibrosed for about an inch where it had been wounded. Resection of the fibrosed portion was performed, followed by suture, and first intention healing was secured. The patient was then returned to the convalescent hospital during my absence on leave. His pain recurred almost as badly as ever and he was accordingly transferred to a hospital at Woolwich. The excised portion of the nerve was subjected to microscopic examination and proved to be dense fibrous tissue containing only a few degenerate nerve fibrils.

These operations were all performed under my own eyes. In fourteen cases my colleague, Captain G. G. Wray operated, with my assistance, in one case Major W. C. Long, I.M.S., and in one case Captain G. O. Wells-Cole; in the remaining forty-five cases I was the operator, with the assistance of one or the other of these colleagues.

In every case the diagnosis made by Captain Kellett Smith was confirmed by the operation findings, and the operative procedure adopted has been justified by the results obtained, with the exceptions noted above.

An important factor in the success has, I think, been that union of the operation wound by first intention has been the almost uniform result.

In only two cases has there been any suppuration and in those it has been superficial and confined to the site of the original wound.

Although the foregoing figures lend themselves to many kinds of analyses, it is obvious that in the present notes only a few general deductions can be advanced.

(1) THE MATTER OF DIAGNOSIS (CAPTAIN KELLETT SMITH).

At first very elaborate tests were carried out in all suspected cases, but the rush of work led us to seek safe short cuts as soon as these declared themselves. As a rule there was no difficulty in deciding whether a nerve required surgical investigation or not; the clinical picture as a whole was generally enough to determine this, although confirmatory electrical tests were always applied; but the borderline cases, in which the trophic condition of skin and muscle was more or less good despite paræsthesia and paralysis to voluntary control, or those again in which there might even be some residual reaction to Faradism, came into a different category.

Here we learnt to depend very greatly as regards tests upon one electrical reaction, viz.: a peculiarly sluggish *relaxation* of the muscle after stimulation with the galvanic current. This sign is best elicited for demonstration in cases of ulnar mischief, when the first dorsal interosseus may be used for the purpose. It served as a good friend in strengthening our decision on many occasions. On its evidence we submitted nerves for operation when opinion in other quarters was adverse, and the results always gave us ample justification.

The sluggishness of the galvanic response is, of course, generally accepted as an important part of R.D. Tinel sums up the position quite tersely. Talking of the galvanic hypo-excitability at the motor point with polar inversion and slow contraction, he says, "Of these three elements, it is slow contraction that seems to be of the greatest importance. Without great hypo-excitability and without polar inversion, slow contraction seems sufficient to characterize the R.D."

We do not know what Tinel means to cover by the word contraction, but we beg to suggest that the type of the *relaxation* phase may reveal more than the actual contraction phase and that there is in addition a type of relaxation, difficult to describe, as always when words are applied to movement, which is characteristic of serious nerve block—a relaxation which looks to be something more than mere "passive effect of extension and elastic rebound"—a relaxation in which the muscle bundles seem to relax in independent time, slowly and deliberately, sometimes producing by this independence an almost wave-like effect curiously reminiscent, in this and in their pace, of the behaviour of unstriped muscle. This particular reaction was especially found in muscles kept functional by massage and stimulation over long periods, whilst the tissues were settling down into a fit state for surgical investigation of the governing nerve.

(2) SURGICAL TECHNIQUE (CAPTAIN HOME).

In exploring an injured nerve it is important to expose and isolate the nerve freely above and below the lesion, then tracing the nerve from both ends through the scar area, dividing the adhesions at the expense of surrounding parts rather

than of the nerve. When the nerve has thus been fully traced, it will be evident whether its continuity has been preserved. Sometimes the two ends are found to terminate abruptly as bulbs, separated by some interval of scar tissue and out of alignment. Sometimes the bulbs are connected by a band of scar tissue in line of the original nerve. Sometimes again there is merely a fusiform thickening of the nerve which may on close inspection be found only to involve a portion of its thickness. In such a case the previously ascertained clinical facts will have prepared the operator to find only partial injury to the nerve.

Lastly, it may be found that when the adhesions have been divided the nerve trunk shows evidence that it has merely been constricted and compressed without itself being scarred.

The decision as to whether to resect the fibrosed portion must depend upon the operator, but he may be guided by the comparison of the hardness and general appearance of the affected portion with that of the trunk above and will usually be able to form a satisfactory opinion.

If resection be decided upon, the method I find serviceable is as follows: With a previously unused knife I make successive incomplete transverse sections of the suspected portions at each end until I come upon definite nerve bundles. Then I pass two catgut sutures at opposing sides of one end of the nerve from periphery to cut surface lengthwise, taking a fair grip of the nerve in the stitch. Each stitch is then passed from cut surface to periphery at the other end of the nerve, on its appropriate side, thus as far as possible preserving the anatomical relations of the component fibres when the cut ends are approximated. In order to pass these stitches it is more convenient to be able to steady the nerve with forceps, and this can be done by gripping the portion to be resected in the forceps. When the stitches are in position, the transverse section can be completed and the nerve ends brought together; but it is I think best not to tie the sutures until two more stitches have been inserted again on opposite edges of the nerve, but this time transversely to its length and about half an inch on either side of the line of junction. Then, if the nerve ends can be approximated without undue tension, these four stitches can be tied and the junction inspected; a few more catgut stitches mainly in the nerve sheath may now suffice to make the union sound and neat. The transversely placed stitches will be found to reinforce the longitudinal and not to cut out so easily. But it is of great importance that there should not be any tension. And to avoid this it may be advisable to prolong the incision upwards and downwards and expose the nerve more freely above and below by blunt dissection for several inches. Then in most cases the nerve will come well together, especially if the neighbouring joint or joints be flexed. The nerve union thus effected is wiped with sterile paraffin and the wound then closed with silkworm gut sutures, attempt being made to secure very accurate coaptation of the skin edges. In a few cases I used Cargile's membrane, but I have found the paraffin method easier and cheaper and quite as efficacious.

At first I poured a little paraffin into the wound, but I found that in one or two cases the wound slightly opened to allow of the escape of a little greasy fluid, which was evidently ejected as a foreign body.

These operations have all been upon limbs and it has therefore been possible to secure end to end apposition in all but one case by full flexion of wrist or elbow or knee.

The one case is of interest. Here the ulnar nerve was completely divided in the forearm and one inch missing. After bulb resection, with full wrist flexion and freeing the nerve as much as possible, we only succeeded in getting the nerve ends within $\frac{1}{2}$ -inch of one another and so had to be content with a catgut bridge, which, for want of a better material, we wrapped in eggshell membrane procured from a hard-boiled egg. First intention healing followed, but as previously noted, the patient was shortly transferred to a hospital in the North and no further report has been obtained.

In two later cases in which similar difficulty has been encountered the desired end has been achieved in the following way :—

In the first case, having failed to get end to end apposition, I proceeded to expose the (ulnar) nerve thoroughly at the elbow with the intention of transplanting it in front of the elbow and so obtaining end to end apposition when the elbow was flexed; but I found that the free exposure had released the nerve so much that the ends met easily (with full wrist flexion), so that I did not transplant.

With that experience, in the second case as soon as I found that end to end apposition could not be secured, I fully exposed the nerve at the elbow and again the fuller freedom obtained allowed the ends to meet when the wrist was flexed.

In the case of the median nerve in the forearm the procedure has been simpler; provided that the nerve was well freed above and below, full flexion of wrist and elbow allowed of end to end apposition even after loss of nearly two inches of nerve, e.g., where the nerve had been divided and the ends were widely separated and bulbous, necessitating free resection before suture.

In some cases my colleague, Captain Wray, resected the nerves obliquely, considering that in this way he obtained more exact coaptation. But I have not done this and from my results see no reason to do so. The proceeding is, to my mind, inclined to be more costly in nerve and more tedious in performance without compensating advantage.

Where the nerve has been only partially divided, we have carefully pared away the scarring fibrous tissue until healthy nerve fibres were exposed, and then sewn the cut surfaces together by looping the uninjured fibres, thus securing approximation of corresponding fibres in the cut surfaces.

In one case of injury to and partial division of the sciatic, it was noted that the external popliteal fibres alone were involved. On exposure at the seat of injury the nerve was found to be fibrosed about half way through, having evidently been partially divided and healed by scarring. The nerve trunk was therefore freed more fully above and below, and it was then possible to separate it to external and internal popliteal elements, which were traced up to the point of scarring, when it was found that the external popliteal alone had suffered and that the internal was practically intact. The scar tissue was therefore resected (about one inch) from the external popliteal, which was sutured end to end, the internal popliteal being looped to allow this. The result proved to be highly satisfactory, sensation and voluntary movement returning before the patient left camp some months later on transfer to a hospital nearer his own home in the North.

In the strangled nerve cases, it has been found that the nerve when freed from the encasing scar, beyond showing evidence of compression, has been of normal appearance and consistency. For this reason no resection has been done

and the results have justified this abstention. In one recent case (median nerve), partial return of sensation to the affected fingers occurred seventy-two hours after operation; and this improvement has since been maintained and increased.

None of these operations have been undertaken under three months after the original wound has been healed and this, I think, is very important with regard to the possibility of an aseptic operation result.

As regards length of time between wound and operation, I may note that in the case of a partially divided sciatic with resulting foot-drop the wound was sustained on November 27, 1917, but on account of prolonged suppuration (necrosis of femur) the operation was not performed until November 27, 1918, when partial resection was done. Yet the report on May 1, 1919, was to the effect that sensation was improving and that voluntary movements of the foot were returning, though as yet feebly; that is to say that there were definite signs of restoration of nerve function though massage was considered still necessary for a further lengthy period.

(3) RESULTS (CAPTAIN KELLETT SMITH).

Does a nerve after division ever completely recover, or, to put it in a different way, does a muscle ever regain its former condition when its nerve has once undergone severance?

Our opinion is in the negative. And when we say this it must be understood that we talk of muscles alone, acting freely and without check caused by any concomitant results of trophic changes in joints and tendon sheaths. These, however small, are often responsible for continued weakness of movement, and ought not to count in weighing the integrity of the muscle-nerve combination *per se*.

A muscle group may recover, and very often does recover, to such an extent that its action differs hardly appreciably from that of its fellow. A musculo-spiral wrist, for example, may serve so well that very astute examination may be necessary to detect any weakness whatever; but when the test of a forced grip is applied it is often found that the patient helps the necessary dorsiflexion of the wrist by pressing against the resistance of the object gripped.

So with an ulnar hand. It may recover to the point that little handicap is perceived in ordinary use, but the finer movements remain slightly awkward—the stiff collar stud is difficult to button, writing is less facile, in playing an instrument the fingers lag a bit.

It is interesting to speculate upon the reason of this residual disability. Possibly degeneration of some of the motor end-plates may have an influence, but the most feasible explanation seems to lie in the effect of nerve injury upon the cells of the anterior cornu. It is known that when a nerve fibre is divided, although the part central to the lesion remains sound, as a rule the nerve cell is profoundly affected. To quote from Starling's "Physiology," second edition, p. 321: "In some cases this change may go on to complete atrophy of the cell, and consequent degeneration of the whole of its axon. Generally, however, the cell gradually recovers, so that six months after the lesion no difference will be observable between the cells on the two sides of the cord." It is reasonable from this to suppose that we may find in the failure of some of the cells to recover an explanation of continued motor weakness, and incidentally we have set before us

a time limit to recovery even under the most favourable circumstances. Moreover the division of a mixed nerve is a different thing to the experimental division of a motor root from which the foregoing deductions are made, and Warrington, in a series of experiments conducted at Liverpool, showed that similar degenerative changes may be produced in the anterior horn-cells by dividing the posterior roots, thus cutting off those impulses by which their activity is normally excited. In the division of a mixed nerve, therefore, we have a double reason for degeneration of the motor cells.

We have noticed a fact which is explicable on this theory. Division of a peripheral nerve whose motor cells are still able to receive associated sensory impulses may be expected to be followed by a more complete recovery than if the reception of such impulses is impossible. For example, the motor cells of a divided ulnar may still receive a sensory stimulus from the median area in the hand, and *vice versa*; but if both median and ulnar nerves are destroyed, then the total sum of recovery in each distribution is less than it would have been had either nerve alone been injured.

The patient appreciates the difference after successful operation before the surgeon can demonstrate it, "the fingers feel warmer," "the hand is different somehow, more life in it," "it feels more like my own again," are frequent expressions.

The first obvious signs of recovery are improved trophic condition—the skin approaches normal in appearance, the characteristic blush fades—and a return of protopathic sensation in the anæsthetic area.

The patient takes interest in this latter point and is generally ready to demonstrate the moving boundary of "deadness." Another interesting remark when some measure of voluntary power has been regained, is, "I don't have to think so hard now when holding something in the hand." This argues perhaps not so much a re-training in the higher neuron as a re-establishment of a lower neuron arc.

Our conclusions then are, briefly, that when all circumstances are favourable the best result is short of perfection, but gives what may justly be called an excellent recovery; that the outlook when two associated mixed nerves are injured is not so good; and that, descending through the range to those cases presenting complications known to be adverse to nerve recovery, operation is still fully justifiable, inasmuch as it will probably give a limb of good nutrition adequate to primary functions.

As regards time we cannot be dogmatic even when circumstances appear equal; we have had the surprise of seeing a divided sciatic transmitting voluntary impulses producing full, although feeble movement, to a leg seven months after union; we have seen power restored to a tibialis anticus after three years.

A sentence in the instructions issued by the Ministry of Pensions is very wise, and covers more ground than is apparent at first sight—"Nerves take a long time to regenerate, even when the two ends of a severed trunk have been united by suture, hence the man will require a considerable temporary pension over a period probably of two years."

(For permission to publish these notes we are indebted to Lieutenant-Colonel F. Ashe, R.A.M.C., O.C. Military Hospital, Eastbourne, and Lieutenant-Colonel C. Martin Row, R.A.M.C., O.C. Military Convalescent Hospital, Eastbourne.)

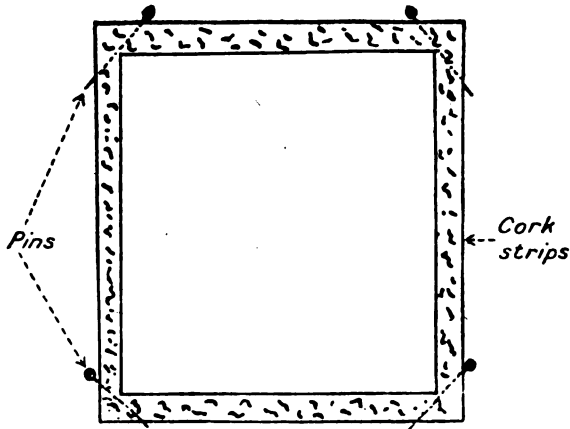
A METHOD OF PREVENTING THE STRANDING OF MOSQUITO OVA WHILE HATCHING.

BY CAPTAIN MALCOLM E. MACGREGOR,

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ANYONE who has engaged in the rearing of mosquitoes from the ova will have realized the difficulty there is with the mosquitoes that lay single eggs, in avoiding considerable loss by the eggs stranding on the sides of the containers, and the consequent drying. The ova by capillarity and the film surface tension tend to be drawn to the water's edge, and are raised above the central water level at the edges of the meniscus. The result is that a very slight evaporation of the water in the container is sufficient to leave the eggs stranded high and dry on the sides of the vessel, and, the embryo soon dies.

I have found that this difficulty can be easily avoided by making floating cork "harbours," which surround the ova as they float on the water. These "harbours" can be constructed very easily from the flat cork slabs sold by entomological dealers. Strips should be cut from the slabs about $\frac{1}{4}$ inch wide, and these should be dipped in melted paraffin to prevent the absorption of water and the waterlogging that would ensue. The strips can then be joined to form a rectangle of any desired size, by driving small pins obliquely through the opposing extremities, as shown in the sketch.



Showing the construction of the cork "harbours."

Float the cork "harbours" on the water of the hatching vessel, and transfer all the ova to the water enclosed by the cork strips. It will then be found that any fall in the level of the water in the hatching dish is immaterial as far as the safety of the ova is concerned. As the eggs hatch the larvæ are not interfered with in any way, and obviously have the whole range of the container.

The "harbours" also make the carriage of the hatching dishes from one part of the laboratory to another much easier, as there is no necessity for extreme care to prevent the water lapping up the sides of the dish and carrying the ova with it. It will be found that a very considerable disturbance of the water is necessary before the water within the "harbours" is disturbed to any extent.

Lecture.

LUNG-IRRITANT GAS POISONING AND ITS SEQUELÆ.¹

By J. S. HALDANE, M.D., F.R.S.

ONE of the more important medical problems presented by the war was the pathology and treatment of poisoning by gases which irritate the lung alveoli, and of the resultant more or less chronic after-effects. I propose in this lecture to review the subject in the light of existing physiological knowledge—a knowledge which has been considerably extended as a result of the clinical, pathological, and physiological studies to which the phenomena of gas-poisoning and its sequelæ have given rise.

Just after the first attack I went out, at the request of Lord Kitchener, to find out what gas was being employed, and how; and to assist in defensive measures. I was familiar with the known facts relating to chlorine poisoning, as I had studied it in connexion with its occurrence in submarines and an alarming personal experience in a sewer connected with bleaching works. From evidence collected at the Casualty Clearing Station at Bailleul, to which I was taken at once, it was clear that the gassing had been produced by chlorine in a concentration of about 1 in 10,000, and used with great skill in a good breeze, so that an enormous volume of cooled and poisonous air was carried over our lines, and very large numbers of men were disabled or fatally injured.

The bad cases were panting, with the chest full of râles, but not dull on percussion. They were also deeply cyanosed, with plum-coloured lips and distended veins, and more or less stupefied. The pulse was frequent, but of good volume and strength. As we were not sure what the cyanosis was due to I examined the diluted blood from one or two cases by the colour test with carbon monoxide, but found that there was no decomposition of the hæmoglobin. The blueness was simply due to anoxæmia; and this has been the case, so far as I know, with the cyanosis produced by all the other lung-irritant gases subsequently employed. One of the Canadians who had faced the first gas attacks so splendidly died while I was at the clearing station; and a post-mortem examination was made at once by Dr. McNee, of Glasgow University. The lungs were voluminous and much congested. Albuminous liquid could be squeezed from them in abundance. The bronchi and alveoli were inflamed, and a great deal of emphysema was present. I need not, however, enter into the details of the picture presented by the lungs, as this has been done fully by Dr. McNee and others. Through the kindness of Colonel Cummins a number of sections of lung from lung irritant gas-poisoning cases will be on view after the lecture.

In the chlorine cases definite symptoms of great irritation of the air passages were present from the first, though it was only later that effusion of liquid, or

¹ A Lecture delivered at the Royal Army Medical College October 8, 1919.

œdema of the lungs, appeared. In the cases of poisoning by phosgene and other lung-irritants used later there was often a delay of several hours before serious symptoms appeared; but in the dangerous cases œdema of the lungs and cyanosis developed, just as in the chlorine cases. There was usually, however, this difference—that the superficial veins were not distended, and the cyanosis was not of a full-blooded type, but paler, with, quite evidently, less blood in the lips and face. These “gray” cases were rather a contrast to the first type, but were even more dangerous. The delay in onset of symptoms resembled what occurs in poisoning by nitrous fumes from explosives, which is fairly frequent in metalliferous mines, and which I studied experimentally many years ago.

The acute emphysema produced in a general acute inflammation of the lungs is easily intelligible if one considers that owing to irregular obstructions in the bronchioles the lungs cannot expand evenly. Hence with the greatly increased breathing some alveoli are enormously distended and give way, so that the lungs are literally torn up to a large extent by the panting. One who has seen on the post-mortem table and under the microscope the lungs from a fatal case of acute irritant gas-poisoning is apt to think that irreparable damage has been done, so that whatever was the immediate cause of death, recovery would have been impossible. I wish to point out as emphatically as I can that such reasoning would be fallacious. The body is a living organism, and not a delicate machine of which the exquisitely complex structure cannot be replaced. Probably emphysema and scar tissue will always remain in the lungs of a man who has been badly gassed; but Nature can and does re-establish the functional efficiency of the lungs. I wish at the outset of this lecture to turn away from the depressing findings of the current mechanistic physiology and pathology inherited by us from the last generation.

What, now, is the immediate cause of danger to life in a bad gas case? I will take the plum-coloured cases first. To the eye of a physician the most serious signs were, firstly, the cyanosis and clouding of intelligence, and secondly, the distention of superficial veins. What did these and the other signs signify? The blue colour signified unmistakably that the blood passing through the lungs was only being very imperfectly oxygenated in spite of the greatly increased breathing. What was the cause of this? To explain it I must take you back to the physiology of breathing.

During normal breathing at rest the oxygen in the lung alveoli, as was definitely shown by Douglas and myself, comes into diffusion equilibrium with the blood, in which condition the hæmoglobin of the blood is almost fully saturated with oxygen, and the arterial blood has therefore its normal bright scarlet colour. To reach the blood the oxygen has to pass through the delicate layer of alveolar epithelium and capillary wall which separates the blood from the air; and during rest there is time for this passage to complete itself. During muscular exertion, on the other hand, diffusion equilibrium may not be complete, as the blood is passing many times more quickly through the lung. The incomplete oxygenation is shown by various symptoms of undue panting and exhaustion, and particularly by the fact that on breathing air enriched with oxygen or at increased atmospheric pressure the undue exhaustion and panting are absent. Persons, however, who are in good physical training derive no benefit

from the oxygen, as was recently discovered by Dr. Briggs.¹ The evident explanation of this fact is that, as has been gradually shown in a long series of experiments in which I have been concerned, the healthy lung epithelium in any condition calling for increased oxygen-supply to the tissues does not merely play the passive part of a lifeless membrane, but actively secretes oxygen inwards. The trained man has not merely more efficient muscles, but also more efficient alveolar epithelium, able to cope easily with the enormously increased oxygen requirements of muscular exertion. On this point I can only speak dogmatically here; but I can assure you that the evidence for oxygen secretion in the lungs is now extremely clear.

To go back to the gas cases, the reason why the blood was not properly oxygenated was presumably that with the swelling and exudation, and paralysis of secretion by injury to the cells, the oxygen could not get through to the blood quickly enough to saturate it to the normal extent. That this may be accepted, at least provisionally, as the true explanation is shown by the fact that, as I could easily convince myself at the clearing stations, the cyanosis disappeared on administration of oxygen, though the hyperpnœa, or most of it, remained. With the cyanosis the clouding of intelligence disappeared unless coma had already been present for some time.

Why did the hyperpnœa not also disappear? As Priestley and I showed in 1908, ordinary breathing is regulated, not by the varying oxygenation of the blood, but by very small variations in its charge of free carbonic acid. Subsequent investigations have gradually shown that it is in virtue of its action as an acid that the carbonic acid acts. What is really regulated by the breathing is the reaction of the blood, and with a delicacy which, when one first realizes it quantitatively, seems absolutely astounding, and is far beyond the limits of delicacy of the present physical or chemical tests. Now in the gassed lungs the giving off of CO_2 through the alveolar wall was impeded as well as the giving off of oxygen. This therefore was the main cause of the hyperpnœa, which of course remained when the anoxæmia and cerebral symptoms were relieved.

Let us now consider the circulatory symptoms in the plum-coloured cases. It was evident from the frequency and volume of the pulse and other indications that the circulation was greatly increased. The capillaries were also distended with blood, as shown by the colour of the lips and skin. Why was this so? I must turn, now, to the physiology of the circulation; and within the limits of this lecture I can only speak dogmatically.

In the main the circulation is regulated, not primarily by the action of the heart itself, but by the rate at which the tissues allow blood to return to the heart. The function of the heart is simply to pass on at increased pressure the blood delivered to it. But what regulates the rate of this delivery? The available evidence points clearly to the conclusion that the regulation depends in the main on two factors. The first is the degree of saturation with oxygen, and the second the degree of saturation with carbonic acid, and consequently the reaction, of the blood in the capillaries. The circulation was increased, and the capillaries were distended with blood, in the plum-coloured gas cases, because both saturation with oxygen was diminished and saturation with carbonic acid

¹ *Journ. of Physiol.*, vol. liii, Proc. Physiol. Soc., p. xxxviii, 1919.

increased, in the blood of the capillaries. As Krogh¹ has quite recently shown, the capillaries do not simply respond passively to the blood-pressure, but actively contract and dilate. The full plum-colour of the lips and skin was a sign of active dilatation of capillaries.

What, now, about the fullness of the surface veins? This signified clearly that the heart was failing to respond to the increased work thrown on it by the increased blood-flow. But this increased work was probably not nearly so great as during very ordinary muscular exertions: yet the heart was failing in its function, and the right side was becoming distended. The work was too much for the right ventricle. The superficial veins and right side of the heart are distended with blood in cases of acute asphyxia. This is a picture which I have repeatedly seen in fatal mining accidents from gas, and is well known in cases of drowning. Why was the heart failing in its proper function? The blue blood answers this question. No organ can work properly without oxygenated blood. The heart was failing because of the anoxæmia, added to the excessive work thrown on it.

Danger also threatened from another side. Not merely the heart, but also the respiratory centre, may show signs of failure. The sign of a failing respiratory centre, as I shall show later, is undue frequency, as compared with depth, in the respirations. The centre may fail with dramatic suddenness.

What can be done to avert the danger? I shall speak first of one means which has the advantage of being always available. This is bleeding. It was found by Macaulay and Irvine, of Johannesburg, in treating cases of acute lung inflammation from nitrous fumes that great relief of symptoms is often produced by free bleeding. The heart is relieved; the venous distension disappears; the high blood pressure in the lungs and consequent increased tendency to œdema is reduced; and the patient may often be able to sleep and is evidently much better. In view of the work of Macaulay and Irvine we recommend bleeding, which, indeed, would naturally suggest itself to any physician who saw the venous distension. Many cases were probably saved by bleeding.²

The second, and by far the most effective, means of treatment is the administration of oxygen. Suitable apparatus for the administration of pure oxygen was available, as already mentioned, even in the early stages of gas-warfare. The difficulties about supplying and using it were not at first realized, however; and before referring further to this subject I shall speak of the second type of gas cases, in which the lips, skin and veins are not distended with blood.

The second type began to be seen when, about the end of 1915, the Germans took to using phosgene and other gases with similar properties. In poisoning by very dilute phosgene, or soon after a short exposure to greater concentrations, there are hardly any symptoms, such as coughing or wheezing, of irritation of the air-passages; and there is often an interval of several hours before serious symptoms show themselves. If the poisoning is very slight there may never be anything more than general depression, nausea, headache, etc., together with incapacity for muscular exertion—the symptoms, practically, of the anoxæmia of

¹ *Journ. of Physiol.*, vol. lii, p. 457.

² See Report by Captain S. Hebblethwaite, R.A.M.C., *Brit. Med. Journ.*, July 22, 1916.

mountain sickness or slight CO-poisoning. In more serious cases there is dangerous fainting on any exertion; and in bad cases lung-œdema develops, and may be fatal.

All the symptoms point quite clearly to injury of the lung epithelium and consequent anoxæmia produced in the manner already discussed. The interference with diffusion outwards of CO₂ in the lungs is, however, much less marked as a rule. On account of its greater solubility CO₂ diffuses out much more readily than oxygen diffuses in with the same difference in diffusion pressure. Hence diffusion of oxygen inwards is apt to be much more interfered with than diffusion of CO₂ outwards. Owing to the bronchitis, emphysema, and corresponding areas of relative collapse in the chlorine cases there is probably more CO₂ than usual in the alveoli which are still permeable to blood. In these cases therefore, there will be an excess of CO₂ in the arterial blood, while in the phosgene cases, with but little bronchitis or emphysema, there is usually no excess. In any case the symptoms, apart from the local signs of œdema of the lungs, resemble those of the uncomplicated anoxæmia of very high altitudes.

What are these symptoms? In the first place there is no great real hyperpnœa during rest. A simple anoxæmia causes very little hyperpnœa, and for the reason that any increase in the breathing washes out more CO₂ from the blood and thus quiets down the respiratory centre. For a similar reason there is very little increase in the circulation or distension of capillaries with blood, and the heart has but little extra work to do. Any increase in the circulation would at once diminish the CO₂ in the tissues, and so render them more alkaline, thus automatically diminishing the circulation again. There is, however, a slight increase in both breathing and circulation in anoxæmia; and this leads to a condition of alkalosis, the existence of which is manifested by the fact that the urine becomes less acid or actually alkaline, and that ammonia formation within the body sinks to a minimum.¹ The so-called "alkaline reserve" of the blood also falls gradually. That is to say the amount of soda available for combination with carbonic acid diminishes. These are "adaptive" changes. The body is doing its best to get rid of the excess of alkali and enable increased breathing to take place without disturbance of the blood reaction.

Unfortunately this adaptive change, though it had been fully recognized as an adaptive change in the expeditions to study anoxæmia on the Peak of Teneriffe and Pike's Peak, was, during the war, detected by new tests, and commonly interpreted as an acidosis to be treated by injections of alkali. I should like in this connexion to add my voice to that of Sir James Mackenzie in his recent vigorous protest against the promiscuous use of new so-called "tests" and special methods, in substitution for the knowledge and judgment which a physician ought to exercise.

At first there is no marked cyanosis in phosgene poisoning, except on exertion, and when the "grey" cyanosis comes it is usually a much more dangerous symptom than the plum-coloured cyanosis. It is very important to realize the cause of this. About fifteen years ago it was discovered by Bohr of Copenhagen and his pupils that the less CO₂ is present in blood the more strong is the

¹ Haldane, Kellas and Kennaway, *Journ. of Physiol.*, vol. liii, 1919.

affinity of hæmoglobin for oxygen. Thus if there is less CO_2 than usual in the air of the lung alveoli, the hæmoglobin will take up oxygen more readily, and the arterial blood will be less apt to be blue in a gas-poisoning case; but, on the other hand, there will be less CO_2 also in the blood of the capillaries. Hence the oxyhæmoglobin will part less readily with its oxygen to the tissues. The upshot of this is that cyanosis, if it is present along with less CO_2 in the blood of the systemic capillaries, is a great deal more serious than if much CO_2 is present, as in the plum-coloured cases. We must, in fact, distinguish between cyanosis and anoxæmia. With an equal degree of de-oxygenation of the oxyhæmoglobin there is less free oxygen in the blood when little CO_2 is present, or when the blood is a little more alkaline, than when more CO_2 is present, or the blood is a little less alkaline.

I wish now to say something, and say it as emphatically as I can, about the effects of anoxæmia. I can speak from personal observation, as I have seen and studied pure anoxæmias of almost every kind, and made many experiments on myself.

Even a very slight degree of anoxæmia, accompanied, it may be, by hardly any noticeable blueness of the lips, has very marked effects on the central nervous system after some hours, as shown by the nausea, headache, and general depression which constitute mountain sickness. With a somewhat greater degree of anoxæmia, such as that experienced at 18,000 feet by average healthy persons not in good physical training, there is already slight impairment of the senses and intelligence, and at about 22,000 feet this becomes very marked. At about 24,000 feet the majority of unacclimatized persons soon become disabled, the senses and intelligence being clouded over and the power of memory completely lost. Again and again, when I asked convalescent officers and men for an account of their symptoms after they had been gassed, they had no memory of what happened to them at the clearing-station, or thought they had been asleep there for several days, though I found out from others that they had been conscious and answered questions as usual. In the chlorine cases, at least, it was merciful that all memory of their sufferings had been obliterated. In an experiment in a steel chamber a few weeks ago, I had gone without acclimatization to a reduced pressure (320 millimetres of mercury) corresponding to an altitude of 24,000 feet, and remained there for over an hour. All the time I was answering questions in a more or less automatic manner, but not the slightest memory of this time remained with me afterwards.¹

The longer a serious anoxæmia lasts the more serious is the damage to the central nervous system, and the longer does it take to recover from this damage, if recovery ever takes place. One can see this most clearly in cases of carbon monoxide poisoning, where the symptoms are due to anoxæmia and nothing else. If a man has been unconscious for some hours in the poisonous atmospheres, he will as likely as not never recover, although practically all the carbon monoxide is out of his blood within two or three hours, so that the anoxæmia is completely removed. In a bad gas or pneumonia case, where severe anoxæmia has continued for long, we must not expect the patient to wake up as soon as oxygen is given

¹ Haldane, Kellas and Kennaway, *loc. cit.*

and the anoxæmia relieved. Recovery of the central nervous system can only be a slow matter at best.

Of all the effects of anoxæmia on the central nervous system, the effect on the respiratory centre is, I think, the most serious. This effect is, however, to a large extent absent in carbon monoxide poisoning and anoxæmia due to slowed circulation or anæmia, because, as I believe, the respiratory centre is supplied with arterial blood, and in the forms of anoxæmia just mentioned the arterial blood contains just as much free oxygen as ordinary arterial blood. In anoxæmia due to imperfect oxygenation of the arterial blood the respiratory centre soon becomes impaired in function. The sign of this is diminishing depth, with increased rate of breathing, and it is a sign of deadly significance when it is due simply to deficient saturation of the arterial blood, or what may be distinguished as *arterial anoxæmia*, as in irritant gas-poisoning. The reason for this is that, as will presently be shown, the shallow breathing increases the anoxæmia, and the anoxæmia the shallow breathing, so that if no relief comes the only end can be death.

In a steel chamber at greatly reduced atmospheric pressure, one can, if one is acclimatized, watch this change in another person. The breathing becomes gradually more and more frequent, and at the same time more and more shallow, as the mental functions gradually fail. It therefore becomes absolutely necessary to stop the experiment. There would be but little actual danger to life in an unacclimatized airman going to 30,000 feet if the respiratory centre could hold out as in carbon monoxide poisoning or loss of consciousness from a simple partial heart-failure. It is failure of the respiratory centre that brings about the deadly danger of anoxæmia at reduced atmospheric pressure, and the same deadly danger is present in the grey gas-poisoning cases and the numerous similar cases of arterial anoxæmia met with in ordinary medical practice.

In a person who is quietly dying in bed one can see the danger approaching. Side by side with increasing shallowness of the breathing one can notice the leaden-gray colour of the lips becoming more and more marked, until at last the change becomes very rapid, and the breathing dies away in the stillness of death. It is usually not heart-failure, but respiratory failure, that is the immediate cause of death. Nature is merciful in this: for there is no quieter and more painless death than death from pure arterial anoxæmia: nor is there any unnecessary lingering over it.

I now come to the effects of anoxæmia on the heart. The effects appear to be very similar on the whole to those on the respiratory centre. One can watch these effects very well in carbon monoxide poisoning, where, for the reasons already given, there is no primary danger from failure of the respiratory centre, and in the acute stage the danger is from heart-failure. I followed them with the help of the very simple and convenient colorimetric method by which the percentage saturation with CO of the hæmoglobin in a drop of blood can be determined accurately. When the hæmoglobin is about a quarter saturated with CO there is no discomfort during rest; but on an exertion, such as the test I used of ascending a stair, dizziness and faintness follow. This means that the heart cannot respond properly to the increased work thrown on it, and the blood-pressure falls sufficiently to compromise the blood-supply, and therefore the oxygen-supply, to the brain. As the saturation of the blood increases it gradually

becomes less and less possible to make any considerable exertion without dangerous fainting; and at fifty-six per cent saturation, beyond which it seemed unwise to go in the experiments, even the exertion of rising from a chair produced faintness and collapse.

But besides the greatly diminished capacity of the heart for work there was a quite marked increase of frequency in the pulse. One can follow this also up to a certain point in a steel chamber at high altitudes, or when air poor in oxygen is breathed. Just at first the increase in frequency may be considerable; but after a few minutes the heart quiets down, owing to the increase in alkalinity of the tissues. What remains is a certain increase in frequency, but accompanied by no corresponding increase in the volume of blood driven out at each beat. The pulse thus becomes frequent and feeble, and finally irregular owing to inco-ordination within the heart, just as we find it in bad gas cases, or in any similar condition where anoxæmia has become serious. In the anoxæmia of the second form of irritant gas-poisoning the immediate danger is, however, from the respiratory centre and not the heart, as I have already explained. Bleeding would be useless or harmful.

I should have liked to discuss the effects of anoxæmia in greater detail, and with reference to other organs beside the central nervous system and heart; but I must now pass on to the treatment of acute gas cases.

Since the main danger to life in lung-irritant gas cases is from arterial anoxæmia, and oxygen, as already mentioned, is nearly always capable of relieving this, it seems evident that treatment with oxygen is of the utmost importance. Like many others, I did not at first realize the practical difficulties of oxygen treatment; and after the early gas attacks I was for a long time engaged in other war-work in quite different directions. In 1916, however, Sir John Cadman asked me to design an oxygen apparatus for the treatment of accidental gas-poisoning among munition workers; and I then designed an apparatus which afterwards came into extensive use in the Army, and was described in a paper published in the *British Medical Journal*, February 10, 1917.

As the danger of anoxæmia in irritant gas-poisoning is due to the diffusion pressure of oxygen in the lung alveoli being insufficient to drive enough oxygen in through the injured and œdematous alveolar walls, it seemed evident that to prevent dangerous anoxæmia it is only necessary to raise this diffusion pressure sufficiently by increasing the oxygen percentage in the alveolar air. A comparatively small addition of oxygen to the inspired air may easily suffice for this purpose, so that pure oxygen need not be breathed. Moreover, as Lorrain Smith discovered, pure, or nearly pure oxygen has itself a slow irritant action on the lungs, so that it is not desirable for a patient whose lungs are already damaged to breathe it for long. If only a moderate percentage of oxygen is added to the inspired air there is corresponding economy of oxygen, and difficulties of transport, etc., are cut down. A further cutting down to half can be effected by so arranging that the flow of oxygen to the patient occurs only during an inspiration, the waste during expiration being thus entirely prevented. By these means the consumption of oxygen is reduced to a tenth or less. A reducing valve and tap are also needed, so that the physician can know precisely what is being given, and regulate the supply of oxygen according to the patient's symptoms. A gauge is also required to show how long the oxygen will last. The latest form of the

apparatus constructed on those principles, and made by Messrs. Siebe, Gorman and Company for the Army Medical Service and for ordinary medical use, is probably already familiar to you, and can be examined after the lecture.

This apparatus was first introduced for trial at clearing stations by Lieutenant-Colonel C. G. Douglas, and, after careful observations with it, came into very general and successful use for continuous administration in gas-poisoning and other cases where anoxæmia was present. As yet, however, extraordinarily little progress has been made with regard to oxygen administration in ordinary medical practice outside the Army; and the most futile methods—I can use no other expression—of oxygen administration are still commonly employed. In whatever way oxygen may be administered the first essentials are knowledge of what is being aimed at, and where the oxygen is going to and in what quantities. The aim should be cure, and not mere temporary palliation of symptoms. We can cure the patient if we can tide him over the bad stage of the anoxæmia. Nature will do the rest.

I now come to the sequelæ of irritant gas-poisoning. The study of these has thrown quite new light on the physiology of respiration, as well as on clinical medicine. Soon after gas-warfare began it became evident that a large number of men who had recovered completely from the acute stages of gas-poisoning, and whose lungs and hearts seemed on physical examination to be all right, were suffering, nevertheless, from serious sequelæ, of which the most prominent was dyspnœa on exertion. Early in 1917 Colonel Meakins, of the Canadian Medical Service (now Professor of Therapeutics at Edinburgh), as a result of a talk with his Consulting Medical Officer, Sir William Osler, referred to me on this subject; and we proceeded to investigate it at the Canadian Hospital, Taplow, after securing through the good offices of the Medical Research Committee the co-operation of my old pupil and colleague, Captain Priestley, besides substantial financial help. My own first impression was that the dyspnœa might be due to the alveolar epithelium not having fully recovered from the gassing, so that some anoxæmia on exertion was still being produced. In partial confirmation of this theory we found that if patients were provided with a light mine rescue apparatus, so that they breathed air enriched with oxygen, they could ascend stairs and perform other muscular work much more easily.

The theory was not sufficient: for we found that the breathing as well as the pulse remained quite abnormal in spite of the benefit derived from the oxygen. In a normal person the breathing becomes far deeper on exertion and is usually not much increased in frequency unless the exertion is very heavy. We found by measurement that in the patients the frequency was enormously increased with very little increase in depth, and whether or not oxygen was given. The pulse also ran away in a more or less similar manner.

At this point let me remind you of some fundamental facts relating to the physiological regulation of breathing. It was discovered by Priestley and myself that the lung ventilation is so governed through the action of the arterial blood on the respiratory centre that the percentage of CO_2 in the alveolar air remains nearly constant. An increase of about 0.2 per cent in the alveolar CO_2 -percentage doubles the breathing during rest, while a diminution of 0.2 per cent produces apnœa. But either slow and deep, or rapid and shallow, breathing will suffice

to keep the alveolar CO_2 -percentage steady. Our work did not show how the frequency and depth of breathing are governed just as they are.

Fifty years ago it was discovered by Hering and Breuer that if in an animal the lungs are kept from distending, the rhythm of respiration is interrupted by a prolonged inspiratory effort, and that there is a similarly prolonged expiratory effort if deflation is prevented. This does not occur if the vagus nerves are cut. Hence distension of the lungs liberates a nervous impulse up the vagus nerves which terminates inspiration; while deflation terminates expiration in a similar manner. The lungs and respiratory centre thus appear to play a continuous game of battledore and shuttlecock. This was described as the "self-regulation" of breathing. The "nervous" and "chemical" theories of the regulation of breathing appeared, and still appear, in the text-books, like oil and water, which do not mix. Three years ago Mavrogordato and I investigated the Hering-Breuer reflex in man, and found that the degree of distension or deflation at which the Hering-Breuer reflex fires off depends on the degree to which the centre is excited by chemical stimuli. Thus the breathing naturally gets deeper with increased chemical excitation of the centre, as during muscular work, and is shallower during rest. When apnoea has been produced by forced breathing, a very small inflation or deflation is enough to liberate the reflex, so that the breathing movements are jammed, and artificial respiration by any of the ordinary gentle methods has hardly any effect. The relation between the "nervous" and "chemical" regulation of breathing was thus cleared up. They act in harmony under normal conditions.

It was evident that in the chronic gas cases the action of the Hering-Breuer reflex was excessive. The patients could not restrain it. The condition could be recognized at once by the fact that the breath could not be held for more than a few seconds. We were thus sent back to the nervous system for an explanation of the dyspnoea in the chronic gas cases. The extraordinary similarity then struck us between the gas cases and those of "soldier's heart," as we used to call it in the old days of the Army Physical Training Committee before the war; and it soon became evident that the breathing of the gas cases was only one of the heads of that many-headed hydra, neurasthenia.

But what about the evidence of anoxæmia in the gas cases? We followed this up. The apparatus before you¹ makes it possible to limit the depth of respiration and at the same time obtain a continuous and true graphic record of the depth and frequency of breathing. By means of this apparatus we found that when the depth of breathing was considerably limited, so that to obtain the necessary quantity of air the frequency of the breathing had to be considerably increased, symptoms of anoxæmia began to show themselves. The most evident of these symptoms was periodic breathing.

At this point I must make a digression on the subject of periodic breathing. Periodic or "Cheyne-Stokes" breathing has been a familiar clinical symptom for a very long time. In 1905 Pembrey made the important discovery on patients at Guy's Hospital that it can be abolished by administration of oxygen. Douglas and I followed this up by showing that by suitable means periodic breathing can be produced in perfectly healthy persons, and that it occurs when the stimulus of

¹ Described by Haldane, Meakins and Priestley, *Journ. of Physiol.*, vol. lii, p. 438, 1919.

slight anoxæmia cuts in to disturb the normal stimulus of the respiratory centre by carbonic acid. At high altitudes periodic breathing is a normal occurrence before acclimatization, and we showed in the Pike's Peak Expedition that it is abolished at once by giving oxygen. In the periodic breathing produced at high altitudes or by other means in healthy persons, the periods of breathing and apnoea were, however, short in comparison with the much longer periods in typical clinical Cheyne-Stokes breathing. On the other hand, the periods in the periodic breathing produced by our apparatus were long, just like typical Cheyne-Stokes breathing. We had thus discovered how to reproduce it. The periodic breathing was also abolished at once on adding a little oxygen to the inspired air, as I hope to show you after the lecture; so the cause was undoubtedly anoxæmia.

But how does the shallow breathing produce anoxæmia? When we analysed the alveolar air we found that the oxygen percentage of the samples was somewhat increased instead of being diminished. We then saw that in trusting to the composition of the mixed alveolar air from thousands of alveoli we were being taken in by one form of the fallacy of averages, and we bethought ourselves of an anatomical paper written in 1908 by Professor Arthur Keith. He showed that in process of expansion the different parts of the lungs open out, not simultaneously, but in succession, like the opening of the leaves of a lady's fan. In shallow breathing, therefore, only certain parts of the lungs will open properly, and these parts will be over-ventilated on account of the rapid breathing. The other parts will be under-ventilated. The mixed alveolar air obtained in taking a sample will, however, show the average composition of the air from over-ventilated and under-ventilated parts.

Now, how does the uneven distribution of fresh air affect the arterialized blood? I think you will see this at once. The hæmoglobin of the blood is nearly saturated with oxygen by normal ventilation. Hence the over-ventilation will, practically speaking, add no more oxygen to the arterialized blood. On the other hand, the under-ventilation will cause the oxygen percentage in the alveolar air to drop considerably below normal, and the net result will be that the mixed arterial blood contains distinctly less oxygen than usual. In the case of CO_2 , however, the over-ventilation can remove just as much more CO_2 than usual, as the under-ventilation removes less. Hence the mixed arterial blood will contain a normal percentage of CO_2 . Actually, however, there may be rather less CO_2 and more oxygen than normal, since the anoxæmia will stimulate the breathing a little.

The net result is thus arterial anoxæmia, and you can now see the deadly significance of the shallow breathing which accompanies failure of the respiratory centre in the acute gas cases, besides understanding the anoxæmia which is more or less associated with neurasthenia and with various other conditions, such as pneumonias, where the breathing is shallow. You can also understand the anoxæmias which often accompany bronchitis, asthma, and emphysema—in all of which conditions the distribution of air may be uneven. Anoxæmia may, for instance, easily develop in the acute bronchitis of mustard gas poisoning, although the lung alveoli are perhaps but little affected.

We had been impressed by the fact that in the chronic gas or neurasthenia cases attacks of acute shortness of breath are apt to come on at night, along with terrifying dreams, and that in general the patients complain of inability to sleep

well, and lassitude in the morning; also that rest in bed does not benefit them. We therefore tried the effect of the recumbent position with the new apparatus. It appeared at once that the Cheyne-Stokes breathing was far more easily produced in the recumbent position, as I hope to show you after the lecture. We thus had in our hands not only the key to some of the characteristic symptoms of neurasthenia, but also that to orthopnoea, a distressing symptom seen in so many cardiac and respiratory cases, and never hitherto explained. It is easy to see that when the respiratory centre is showing signs of failure orthopnoea must result, as well as Cheyne-Stokes breathing in individuals in whom it can be produced—for in some persons it is much less readily produced than in others.

Let us now go back to the neurasthenic respiratory centres. What is wrong with them? So far it has only appeared that they behave as if they were quite abnormally sensitive to the Hering-Breuer reflex. To investigate this and other points we determined to produce experimental fatigue of the respiratory centre in normal individuals, and for this purpose introduced resistances into the breathing circuit, so that we could make the breathing as laboured as we wished. Colonel Meakins had meanwhile been recalled to Canada, so by arrangements sanctioned by the Director-General the work was transferred to the Ashhurst Military Hospital, near Oxford, and continued by us there, with the co-operation of Captain H. W. Davies, of the Australian Medical Corps.

The immediate effect of resistance to breathing is to produce slowing and deepening of the respirations, as might be expected in view of what has already been said with regard to the Hering-Breuer reflex and its relations to the chemical stimuli to breathing. But if the resistance is excessive, or, what comes to the same thing, if with only a moderate resistance the breathing has to be increased in consequence of muscular exertion, a new phenomenon appears. The breathing begins to get shallower, more frequent, and less effective, till at last it becomes so shallow that anoxæmia results and the face becomes blue. This change—exhaustion of the respiratory centre—may appear with dramatic suddenness, thus putting an end to an experiment.

With exhaustion of the respiratory centre, therefore, the Hering-Breuer reflex seems to get the upper hand and jam the breathing. In some persons this effect is far more easily produced than in others—a fact of great interest in connexion with the troubles experienced by some men from resistance in the box respirator or in mine rescue apparatus. The exhaustion effect is far more easily produced, and with only a very small resistance, if even slight anoxæmia from imperfect oxygenation of the arterial blood is present. This also is a fact of great significance. Even when no artificial resistance is present, and the breathing is perfectly free, the shallow and rapid breathing of an exhausted respiratory centre begins to appear, as I have already explained, in the anoxæmia of diminished barometric pressure, and leads inevitably to death if the pressure remains too low.

We can thus produce experimentally and temporarily in healthy persons a condition similar to that of the neurasthenic respiratory centre. The neurasthenic respiratory centre is apparently an exhausted respiratory centre; but how is this exhaustion produced through gassing and other causes, and why is it so lasting? What also of all the other manifestations of neurasthenia? In all these manifestations there seems to be the common factor that reflexes of one kind or another are, as it were, running riot through weakening of central

control. The Hering-Breuer reflex is upsetting the breathing: the accelerator, or sometimes the inhibitory, or perhaps the depressor reflex, is upsetting the heart's action; vaso-motor reflexes are upsetting the local circulation; sweating reflexes are firing off at inopportune moments; hyperalgesias are causing much discomfort. In general the patient is more or less in a state of "nerves," and is incapacitated for ordinary work, though often, as in the emergencies of war, he can "pull himself together" for the time.

I cannot pretend to offer any complete explanation of neurasthenia beyond giving you the above evidence that it may be regarded as a lasting fatigue of central functions; but I may perhaps point out firstly that it may be very localized, and was so, for the most part, in the gas cases. There it was mainly the respiratory centre that became neurasthenic. In mustard gas cases it was often the eyes. Men with photophobia lasting long after all irritation of the eyes had subsided were commonly met with; or men with neurasthenic laryngeal symptoms if they had inhaled some of the vapour. Another interesting group consisted of men apparently suffering from neurasthenic asthmatic symptoms produced by trifling inhalations of chloropicrin or other irritants to the respiratory passages. Local or general neurasthenias are evidently extremely common and of the widest importance in ordinary medical practice.

A second point is that many different causes may produce local or general neurasthenic symptoms, and particularly the affection of the respiratory centre and cardiac centre. One of these causes is an acute infection, as has been clearly pointed out by Lewis and others. Another is acute anoxæmia, as is well seen in the sequelæ of severe carbon monoxide poisoning, familiar to me among coal miners, and rendered still more familiar by the many cases which occurred during the war. To what extent the neurasthenia of irritant gas poisoning has been due to the anoxæmia during the acute stage it is difficult to judge; but in many cases, particularly those from mustard gas, there was no acute anoxæmia. Another cause seems to be over-exertion. The operation of this cause in the production of "soldier's heart" in the training of recruits occupied the attention of the Physical Training Committee in the years before the war. Excessive mental strain or worry is certainly another cause. Finally, there is what is called "shock." Great attention has been paid to the circulatory side of "shock"; but I think that the respiratory side is even more worth attention. The shallow and rapid breathing of shock means imperfect oxygenation of the arterial blood, with all its deadly secondary consequences; and this danger, at any rate, can be averted by treatment with oxygen. I feel, however, as regards oxygen treatment in various conditions of disturbed breathing, that I am in the position of the shoemaker who cannot help thinking that there is nothing like leather.

As regards treatment of the neurasthenic sequelæ of gas-poisoning I have little new to suggest. The main point seems to be not to keep the patient coddled up, but to give him plenty of fresh air and cheerful employment, cautiously increased as the symptoms pass off. If, however, sleep is much disturbed by the anoxæmia of shallow breathing, continuous administration of about one litre a minute of oxygen during the night is likely to be useful at first, to judge from the observations at Taplow. The anoxæmia at night probably prolongs the neurast

thenia. War experience has at least shown clearly that neurasthenia is neither an imaginary nor an incurable complaint.

The new medical and surgical facts and problems presented by the war are enough to occupy us for many years to come. In this lecture I have only been able to glance at one group of these facts and problems; and I hope I have been able to show you that physiology has not only thrown light on them but has itself got very important new light from them.

Let me add a few concluding words on the relation of physiology to medicine. As perhaps might be expected of a representative of an old university which does not forget the past, the physiology I have been preaching to you may be new as regards some of its facts, but is very old as regards its underlying principles, which are those taught more than 2,000 years ago by Hippocrates. To the mechanistic physiology of the last two generations the body appears as a machine the exquisitely delicate mechanism of which it is beyond the wit of man to repair when once it is out of order. Hippocrates also taught that it is beyond the wit of man to cure disease by direct means. He was not a quack. He pointed out, however, that the body is no mere machine, but a living organism, and that it is of the "nature" of a living organism to cure itself; also that by persistently studying the working of this "nature" (*physis*), we can learn how to help it towards cure—how to tide it over emergency and give it what it requires to effect the cure—how, in short, to be a "physician." His teaching and that of the great leaders of British medicine who followed him was a message of hope to clinical medicine and of incentive to physiological study. It is in the spirit of that teaching, and not of the dismal mechanistic physiology and pathology which are now passing away, that I have tried this evening to approach the medical problems presented by gas-poisoning.

[The lecture was followed by demonstrations on a patient, on a normal individual, and of microscopical sections of lung from gas-poisoning cases.]

Report.

REPORT OF A COMMITTEE OF INQUIRY REGARDING THE PREVALENCE OF PELLAGRA AMONG TURKISH PRISONERS OF WAR.

(Continued from p. 447.)

STAGE III.

At the instance of Dr. W. H. Wilson, who had realized and previously pointed out the importance of the biological value of protein in gauging the sufficiency of diets, a column for this value was completed in calculations of the proximate principles in all dietaries brought under review from so many and so varied sources. Before proceeding, it is desirable to offer a few brief notes regarding this comparatively recently introduced factor.

Biological Value of Protein.

It has long been realized that the amount of gross protein in a diet affords an unsatisfactory basis of comparison, in that vegetable protein is much less available for assimilation than is that derived from animal sources. It has been further found that the value of protein does not depend wholly, or even mainly, upon such points as, e.g., its slow digestion when associated with cellulose in vegetable matter, but upon the amounts and form of certain amino-acids bound up in its complex molecule.

Later bio-chemical research showed that, although assimilated protein possesses energy value, only certain of its associated amino-acids present nitrogen in a form which the tissues can utilize to rebuild their substance and replace wastage. Subsequently it was found that the minimal amount of ingested animal protein which enables the experimental man to maintain nitrogenous equilibrium is 30 grammes, and that vegetable protein is required in amounts varying with its source to such an extent that equilibrium cannot be maintained on a lesser daily intake than, e.g., 102 grammes of maize protein.

This led to production of a scale of protein equivalents, as compared with that of animal protein taken as unity, and hence to adoption of the term "biological value of protein." The necessarily slow work of ascertaining these values by long experiment proceeds, but certain items having an important bearing upon the aetiology of pellagra are thus tabulated.

Protein source			Smallest amount protecting a man of 70 kilos from loss of body protein			Biological value
			30 grammes a day			
Meat	..	..	30	"	"	1.000
Milk	..	..	31	"	"	0.965
Rice	..	..	34	"	"	0.880
Beans	..	..	50	"	"	0.600
Bread	..	..	76	"	"	0.395
Maize	..	..	102	"	"	0.293

It is of special interest that maize, the dietetic use of which has been so closely associated with pellagra incidence, provides proteins almost entirely deficient in the essential amino-acids tryptophane and lysin.

In interpreting this table it must be remembered that the minimum of 30 grammes of protein of maximum biological value can only protect the body from loss of weight if it actually reaches the tissues. It may be diverted by loss through defective assimilation; or, after assimilation, by being utilized to meet immediate demands for energy production not fully provided for by other items in the dietary. It is obvious therefore that this value is only adequate for men not weighing more than 70 kilos, having normal digestive power, and getting a diet providing from other substances sufficient total calories to balance the energy output and make good the fat loss.

In a body of men doing equal work on a uniform ration sufficing for the great majority, the heaviest men and those suffering from defective digestion may thus become pellagrous on a diet fully adequate for average normal needs.

Dr. Wilson had previously suggested, as minimal amounts per diem, a biological protein-value equivalent to 45 grammes for hard-labour and 40 grammes for either light-labour or non-labour.

It was only when sufficient exact dietetic data had been collected to permit of their values in calories and proximate principles being embodied in a graph distinguishing diets associated with pellagra, that the importance of this factor became fully apparent.

The Biological Value of Protein in relation to Pellagra.

(a) Association of Pellagra with diets of low biological value of Protein.

Graph 7.

This association is illustrated by reference to graph 7, from a study of which the following deductions are made :—

(1) That there is no general relation between the occurrence of pellagra and the total calorie value (Nos. 3, 4, 5 ; 13, 20 and 21).

(2) That relative fat deficiency is not the determining factor in pellagra production (Nos. 4, 5, 19 ; 14, 20 and 21).

(3) That a low gross protein intake is not *per se* the determining factor (Nos. 3, 4, 5 ; 13, 20 and 21).

(4) That there is a remarkably uniform indication from this graph that the real determining factor is the amount of the biological protein value, in that pellagra—with a single exception—occurs or does not occur according as that value is less or more than 40 grammes per diem.*

(5) That both labour and non-labour Prisoners of War (8, 13) became clinically pellagrous on diets which, after allowing for the ascertained loss by non-absorption in the predisposed, provided less than a biological protein value of 40 grammes, although up to all previously accepted standards in other respects.

**Note.*—In the one exception under para. 4 above (No. 20) the diet is about to be increased because one class of hard labour requires per diem (five and a half days' work a week) 7,980 kilogrammetres more energy than the existing diet provides. It is significant that the protein equivalent of that deficit is 13.9 grammes, whereas the biological value only exceeds the 45 grammes standard for hard labour by 8.4 grammes.

Graph 8.

The above association is further illustrated by the valuable indications of graph 8 which records the influence of diet upon the onset, progress and dis-

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appearance of pellagra in a community of Armenian refugees living during the whole period in the same desert camp near Port Said, where the general conditions remained otherwise constant and closely resembled those at East Kantara Labour Camp, which is, however, over four times farther distant from the Sweet Water Canal.

It was expected that these refugees would be able to supplement their rations from earnings, but they failed to do so and pellagra broke out among them after some five months on a diet of 2,200 Calories and twenty-two grammes biological value of the protein.* Once established, pellagra increased steadily until the men got work in another area when it began to decrease as soon as wages sent by men enabled their families to augment their food supply. In mid-September the men stopped work and returned to camp, upon which the falling curve again began to rise. Introduction of a new diet of 3,039 Calories and 40.9 grammes biological protein value* was followed by the curve of new cases steadily falling to zero, where it has remained ever since.

Graphs 7 and 8 therefore lead to the conclusion that pellagra is induced by dietaries deficient in biological protein value, and confirm the following provisional minima for normal persons :—

Non-labour	..	..	40	grammes per diem.
Light labour	..	..	40	" "
Hard labour	..	..	45	" "

* *Note.*—Throughout dietetic values have been reduced to the standard equivalent for males weighing 70 kilogrammes.

(b) *Recovery from Pellagra on diets of increased value of Protein.*

If graph 8 be considered in conjunction with diets numbers 2 and 7 of graph 7, it may be further concluded that pellagra—if not too advanced—can be checked by an increase in the biological protein value. This is supported by the fact that, in an experiment lasting three weeks, a group of patients given hospital diet without milk but with extra protein derived from beans gained more weight than another group on hospital diet with added butter, although these experimental diets were of equal total caloric value.

37 control cases on ordinary diet	=	average gain of 1.0 lb.
10 cases on extra butter	=	" " 2.2 lb.*
10 " " beans	=	" " 7.0 lb.

* But for the great increase in weight of one patient in this group, the average increase would have been approximately 1 lb. less.

(c) *Can a low biological protein value explain the principal established facts regarding the Epidemiology of Pellagra?*

This interesting question cannot be discussed here, and can only be briefly dealt with in Appendix 9, but it is considered that an adequate explanation is thus afforded for the great majority of these established facts.

(d) *Observations still in progress.*

(1) The effect of introduction of extra pulses and fat in the prisoners' diets (on November 15) upon subsequent pellagra incidence.

Attention is drawn to the decline in the admission rate for labour prisoners since November 30, as shown in graphs 3 and 4.

(2) The effect of cessation of labour in East Kantara Camp.

(3) The experimental comparison now in progress at Ludd Labour Camp.

Since this camp reopened, pellagra incidence rates are being compared on (a) the labourers and (b) a group of 500 men performing no work but otherwise under precisely the same conditions as the labourers, even including the issue of working pay so that similar canteen extras can be purchased by both groups.

(4) Development of certain biochemical researches.

Completion of Stage III.

The following conclusions were reached:—

(1) That pellagra is due to a deficiency in protein, as gauged by its biological value.

(2) That this deficiency may be:—

(a) Absolute, as regards minimal requirements when at rest.

(b) Relative as regards:—

(i) The balance between energy income and energy expenditure.

(ii) Individual efficiency of assimilation.

(3) That pellagra manifestations can be arrested, in their early stages, by an increase in biological value of protein in the diet.

Recommendations.

(1) In view of the pellagra admission rates having remained approximately constant in non-labour camps during the last two months, and having diminished so markedly in labour camps in the present month (*vide* graphs 3 and 4) it is considered that the full authorized diets are adequate and that it is not necessary at present to introduce any cardinal change.

(2) Full variety should be given, under the alternatives of the existing ration scales, and close supervision should be exercised over preparation and cooking of food—with special regard to pulses in both respects.

(3) Any increase in pellagra should be met by an increase in animal protein; the occurrence of œdema should be met by an increase in fat.

(Signed) F. D. BOYD, Colonel, A.M.S.

(Signed) P. S. LELEAN, Lieutenant-Colonel, R.A.M.C.

CAIRO,

December 31, 1918.

Addenda.

(1) The Committee take the opportunity of gratefully acknowledging the valuable services of their collaborators, whose loyal co-operation has alone rendered the completion of this investigation possible.

They wish also to express their thanks for assistance so willingly rendered by the A.D.M.S., F. in E. (Colonel Knaggs); the Director, Kasri el Aini Medical School (Dr. Keatinge); the Superintendent, Khanka Asylum (Dr. Dudgeon); the Medical Officers, Egyptian P.H.D. (Drs. Todd and White); The Inspector, Prisoners of War (Lieutenant-Colonel Simpson); the officers commanding Prisoners of War Hospitals (Lieutenant-Colonel Vickerman, Major Strathearn, and Captains Geddie, Burridge and Higgins); and, in the laboratories, by Captain Dew and Pte. Hulson.

The exceptional quality of the graphs and charts is due to Serjt. Perry as regards their preparation, and to the kindness of Mr. Rowntree, of the Survey of Egypt drawing-office, as regards their reproduction.

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(2) The Committee desire to express their special indebtedness for the great and essential assistance voluntarily given by Professor W. H. Wilson.

With regard to the section dealing with dietetics and the ætiology of the disease, it would have been impossible to complete this part of the report and the graphs accompanying it in the time available, without the cordial co-operation of Dr. Wilson, and the use of a large amount of very valuable information collected by him during the last three years and kindly placed by him at their disposal.

This information has been enlarged and in some cases revised by collaboration. These data, with such conclusions embodied in the Report as are identical with those Dr. Wilson had previously arrived at, he proposes to include in a paper on the "Diet Factor in Pellagra" which he hopes to publish.

Cairo,

December 31, 1918.

F. D. B.

P. S. L.

APPENDIX I.

THE CLINICAL ASPECT OF THE ILLNESS AMONGST TURKISH PRISONERS OF WAR.

A.—Medical Inspection and Features of the Disease in Camp.*

The prevalent illness affecting the Turkish Prisoners of War can, owing to the method of medical inspection in practice, be observed from the initial signs to the fully developed clinical picture. The Turkish prisoners of war in the labour camp at Kantara were medically inspected in the beginning of July, 1918, and every prisoner whose physical condition was in the least deteriorated was eliminated and transferred to the Cairo camp. Since then there has been a fortnightly medical inspection of the working prisoners, company by company, carried out by a Medical Officer detailed for the purpose. All individuals are recorded on the first date of showing any suspicious sign, and the usual progress, as noted at subsequent fortnightly intervals, is as follows :—

(a) A fortnight later the first demonstrable sign of any departure from the normal is a light pigmentation on the back of the hand and wrist, accompanied by dryness of the skin, although there may be free perspiration on other parts of the body.

(b) A month later the condition of the hands and wrists is more marked, while there may be slight pigmentation visible on the nose. The individual is at this time a strong man with apparently normal digestion, and there is no complaint of illness.

(c) By the end of the sixth week the condition on the hands has further progressed, the skin being now loose, glazed and wrinkled. Pigmentation of the nose is spreading out over the cheeks. Definite nutritional changes have appeared; there is loss of muscular tone and substance, especially noticeable in the upper arm and shoulder girdle, associated with complaint of general weakness. Some disturbance of digestion occurs, indicated by burning sensation after food, anorexia, or intermittent diarrhœa. Estimation of the blood-pressure shows that it has fallen—frequently to 90-100 S.B.P. The prisoner has now become unsuitable for a labour camp and is transferred to hospital for treatment.

B.—Clinical Study of Cases in Hospital.

In order to study and report on the clinical condition from which the Turkish prisoners of war suffered, 100 cases were selected from a batch of prisoners. These were all active combatants who had come directly from the Turkish lines. They were admitted to special wards in No. 2 Prisoners of War Hospital, Cairo.

(a) Earlier Cases.

In many cases it was very difficult to get any intelligent MEDICAL HISTORY. Many had no complaint of illness; others stated that they had noticed the change in colour of the hands for a period varying from one month up to two years.

The most noticeable feature in the condition was an invariably symmetrical pigmentation, and dryness of THE SKIN. This was very marked on the dorsal surfaces of the hands, wrists and feet, which were also scaly and wrinkled. The nose was similarly affected and frequently pigmentation spread out thence over the cheeks in a "batwing-like" outline. A patch from the pigmented dry, glazed and wrinkled skin of the neck also frequently spread down the sternum in a "cravat-like" form. On the body points of pressure showed pigmentation such as the malleoli, the dorsum of the foot where the shoe-strap pressed, or a circular band round the waist when a belt had been worn. Any scars on the body or limbs were deeply pigmented. In no case was pigmentation of the buccal mucous membrane observed.

While perspiration occurred naturally elsewhere, the affected skin was always dry, and remained so in twelve cases in which a hypodermic injection of pilocarpine caused free perspiration on the unaffected areas.

NUTRITION in all except a very few cases was definitely affected, sometimes profoundly so even early in the disease. The loss in substance and muscle tone was first noticeable in the upper arm and shoulder girdle. In a limited number (25 of the 100) nutrition was fair or even good.

The TEMPERATURE was usually subnormal. When pyrexia occurred it was always due to an infective condition complicating the original disease.

The ALIMENTARY SYSTEM showed definite changes. In 45 of the 100 there were complaints of digestive disturbance in the form of anorexia with burning and flatulence after food, but the most common complaint was of diarrhœa, usually of an intermittent type.

Fissures at the angle of the mouth were common. The gums were invariably ulcerated and pyorrhœa was marked. The tongue was characteristic; at first it was moist, large and indented by the teeth, with edges and tip of a bright pink colour and devoid of epithelium, the dorsum being coated and frequently fissured, while in more advanced stages the loss of epithelium had spread over the whole dorsum, giving the tongue the bright pink appearance of raw beef. The fauces showed no abnormality and there was no pigmentation of the buccal mucous membrane. In a limited number of cases there was some swelling of the parotid gland, apparently secondary to buccal sepsis.

The appetite was described as "good" in 12 cases, "fair" in 7, "absent" in 11. The loss of appetite was accompanied in all except one case by intermittent diarrhœa.

Table I shows the condition of acid secretion in the gastric contents after a test meal. This table shows very clearly that early in the disease, before any digestive difficulties are apparent, the secretion of hydrochloric acid is low. As the disease progresses and digestive difficulties become a feature, hydrochloric acid is entirely absent from the gastric contents an hour after a test meal.

The stools of those patients were remarkable in containing abundant evidence of various infections, ascaris eggs being almost invariably present.

The liver was normal to physical examination, the area of percussion dullness being if anything somewhat under the normal except when the clinical picture was complicated by a malarial infection causing hepatic enlargement and tenderness.

The CIRCULATORY SYSTEM showed a lack of tope early in the disease. In most cases it was difficult to define the apex beat of the heart. The area of cardiac dullness was normal in every case and the sounds feeble. No murmurs were present. The pulse frequency was as a rule between sixty-five and seventy-five per minute, the rhythm was regular, the volume small, and the vessel wall healthy.

Table II shows the results of blood-pressure observations taken in the working Prisoners of War Camp at Kantara. All the subjects of observation were working prisoners living on rations in camp.

They may be divided into three groups:—

(i) The first group comprised healthy men actively engaged in labour and with no complaints of illness. The average healthy Turkish prisoner of war on ration diet gave a blood-pressure—systolic 125 and diastolic 94 millimetres Hg.

(ii) The second group included those who were graded as “strong” men and showed absolutely no interference with nutritive functions, but had on the back of the hands very slight pigmentation and some dryness. They gave a blood-pressure distinctly below the normal average, i.e., 119 to 92 millimetres.

(iii) In the third group, i.e., those whose nutrition had become even slightly affected, the fall in pressure was more distinctly marked, 111 to 29 millimetres.

It would appear, therefore, that a definite fall in blood-pressure precedes any actual signs or symptoms of illness, and may be of value as early evidence of impaired vitality and resistance.

Table III shows the blood-pressure, etc., in 100 early cases in hospital. The average systolic pressure stands at ninety-two millimetres. Study of the table shows that when nutrition was most profoundly affected the blood-pressure was not always the lowest. In several patients whose nutrition was fair the S.B.P. was in the eighties, and in one case seventy-eight millimetres, while a number of whose nutrition was very poor indeed had a S.B.P. of 100—well over the average for the group. There thus does not appear in this group to be any definite relation between the degree of impaired nutrition and the S.B.P.

Table IV shows the pressure in advanced cases, many complicated with intestinal infection. The blood-pressure in all is low, but again there is no definite relationship between it and the degree of emaciation present.

Table V shows the condition of a number of recovered pellagrins in the Armenian Camp at Port Said, most of whom had suffered from one or two recurrences of the disease. In all nutrition was good and the blood-pressure had returned to the normal.

A limited number of cases showed some œdema of the ankles.

The RESPIRATORY SYSTEM in uncomplicated cases was normal to physical examination.

The HÆMAPOIETIC SYSTEM in uncomplicated cases showed no great departure from the normal. The spleen was normal except where there had been a malarial infection. The blood showed a mild type of chlorotic anæmia, with a low colour index. Examination of blood-films, stained and unstained, showed no increase in the large mononuclears. No parasites or protozoa were found, and blood cultures were invariably sterile.

The URINE in the early cases was free from albumin and sugar. The reaction was, as a rule, faintly acid. When malaria occurred as a complication, albumin was sometimes present in considerable quantities.

The CEREBROSPINAL FUNCTIONS showed changes in the vast majority of cases. Cerebration was very slow, the patients were dull and apathetic, and took little or no interest in their surroundings. In some cases the condition had passed into definite melancholia.

Tactile sensation was normal in all, and the vibration sense was easily elicited, except when cerebration was very dull, and then the loss of appreciation seemed to be central rather than due to any interference with conduction. Rombergism was never present. The motor functions showed no paralysis. Muscles were flabby and wasted and the muscle tone was poor. The plantar reflex was seldom elicited, apparently owing to the great thickness and hardness of the skin on the soles of the feet. The abdominal reflex was usually present, except when some acute intra-abdominal condition associated with diarrhoea seemed to determine its absence. Chovstek's sign was never present. The arm-jerks were commonly present. The knee-jerks were usually diminished early in the disease—to become exaggerated later, and finally lost when muscle tone was profoundly affected. The ankle jerks were usually normal. The pupil reflex was normal in every case.

Lumbar puncture was carried out in twelve typical cases. In only one was there any increase in pressure. In all the fluid was clear; contained no increase in cell-elements or abnormal cells; was sterile on culture; and afforded no evidence of a protozoal infection.

(b) Advanced Cases.

When considering the advanced type of the disease, one is constantly faced with a complex clinical picture. Of the large number of advanced cases seen in different hospitals, the vast majority suffered from a complicating disease. This was frequently malaria, but even more commonly dysentery—either bacillary or amœbic—these individuals being especially liable to the bacillary variety. The resistance of these subjects is lowered by failure of nutrition; the secretion of hydrochloric acid in the stomach is diminished or absent, and thus they lose the natural protection against invasion of the alimentary canal by infective processes—with dysentery as the natural result.

(c) Diagnosis.

Although only a small number of the many advanced cases showed the disease in an uncomplicated form, these were so typical as to enable the observer easily to arrive at a diagnosis of pellagra.

There was very marked erythema and pigmentation of the face, neck, hands

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and feet. On the face this was most noticeable on the nose and cheeks, spreading out over the latter in a "batwing-like" form. The neck was markedly pigmented, the erythema and pigmentation in one case forming a distinct collar going on to desquamation and ulceration. The pigmentation spread down the sternum. The back of the hand and wrist showed marked erythema and pigmentation, some cases developing blisters and deep cracks. The dorsum of the foot was deeply pigmented, the pigmentation spreading up the shin. The skin was dry, wrinkled and scaly. Over the great trochanters and tuberosities were frequently pigmented callosities. All points of pressure and scars were pigmented.

Nutrition was profoundly affected, emaciation being marked. The appetite was poor, the gums were ulcerated and pyorrhœa was marked. The tongue was moist but so devoid of epithelium as to appear raw. Diarrhœa was present from time to time but no specific organisms or protozoa could be isolated.

The mental functions were profoundly depressed. Cerebration was very slow, and the outlook on life melancholic.

Such a clinical picture can only apply to pellagra. From this fully developed clinical picture the disease could be traced through fine gradations in sequence back to the earliest indications in the strong labourer in the working camp, showing but slight pigmentation of the hands. This mild pigmentation has been followed in the individual to the development of nutritive changes and admission to hospital as a definite pellagrin.

A very limited number of cases in the present outbreak have shown considerable œdema of the lower limbs, but beriberi is excluded by the definite absence of any evidence of peripheral neuritis, alteration in sensation, or paresis.

The clinical phenomena of pellagra as seen in this outbreak strongly point to an affection of the adrenals with profound exhaustion of the chromaffin system. The early loss of circulatory tone, with pigmentation, is characteristic of adrenal insufficiency. Defective acid secretion in the stomach must inevitably lead to diminished pancreatic secretion and consequent defective digestion resulting in mal-nutrition. The individual may swallow sufficient food but the digestion and absorption of protein and fat will be defective. This is actually shown by metabolic observations which demonstrate the loss of these proximate food principles by the bowel.

(d) Prognosis.

The prognosis in this disease seems very much to depend on the question of secondary infection. Granted that the disease is early and uncomplicated, if the individual is placed at rest and on a generous diet improvement will take place. The individual gains in weight and intestinal disturbance subsides, even without any medical treatment. Our early cases were placed on (a) ordinary diet, (b) ordinary diet with twenty grammes butter added, (c) ordinary diet without milk but with an addition of twenty grammes of beans or lentils. All gained in weight and improved, but the most rapid gain was made by those to whose diet the extra vegetable protein had been added.

Very different is the picture when the pellagrin becomes infected with bacillary dysentery or septic pneumonia. The general resistance of the individual is so lowered that the secondary disease at once assumes a very grave type, and a rapidly fatal termination may be expected. Amœbic dysentery was not so fatal,

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as response was obtained to treatment by emetine. Death from uncomplicated pellagra was in our experience uncommon.

Conclusions :—

(1) The disease which has been prevalent amongst the Turkish prisoners of war is pellagra.

(2) The condition is characterized by erythema and pigmentation of the exposed parts of the body, by profound disturbance of nutrition, and by a fall in blood-pressure.

TABLE I.—TO SHOW TOTAL ACIDITY AND FREE HYDROCHLORIC ACID IN GASTRIC CONTENTS AFTER A TEST MEAL.

Acidity expressed as per cent N/10 NaOH.

Early cases		More advanced cases	
Total acidity	Free HCl.	Total acidity	Free HCl.
30	Absent	35	Absent
34	10	20	"
40	5	35	"
20	Trace	35	14
50	10	20	Absent
68	30	35	12
40	Absent	50	Absent
32	10	30	"
38	Absent	25	8
76	36	35	Absent
60	20	30	"
28	Absent	45	5
60	5	35	Absent
110	20	40	"
80	40	30	"
84	50	15	"
30	8	25	5
35	8	68	8
35	15	25	Absent
40	12	15	"
45	15	22	"
55	15	35	3
34	Absent	55	8
44	5	40	Absent
45	5	20	"
45	25	35	"
55	10	42	5
45	10	50	5
35	15	55	Absent
25	3	30	"
22	10	25	"
20	5	38	"
20	8	..	..

Average { Total acidity = 39.77 per cent decinormal alkali.
Free HCl = 7.35 ..

(3) Digestive disturbance with intermittent diarrhœa is a prominent feature of the disease: defective secretion of hydrochloric acid leads to disturbance of pancreatic function, defective digestion, and mal-assimilation of protein and fat.

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(4) The clinical features of the disease are those of a profound suprarenal inadequacy, but there is no sufficient evidence to prove how this inadequacy is produced.

(5) There is no evidence from the clinical and pathological findings of any specific protozoal or bacterial infection.

TABLE II.—BLOOD-PRESSURE OF TURKISH PRISONERS OF WAR, EAST KANTARA LABOUR CAMP.

(1) Healthy Turkish N.C.O.s.

Age					Blood-pressure
25	..	..	..	..	132—92
25	..	..	..	..	128—104
25	..	..	..	..	122—90
38	..	..	..	..	130—98
32	..	..	..	..	130—98
28	..	..	..	..	118—90
44	..	..	..	..	120—90
29	..	..	..	..	128—96
25	..	..	..	..	122—90

Average, 125—94 mm. Hg.

(2) Strong men with evidence of early pigmentation; nutrition good.

Age					Blood-pressure
31	..	..	..	..	130—100
36	..	..	..	..	128—100
28	..	..	..	..	116—90
27	..	..	..	..	112—88
36	..	..	..	..	116—94
35	..	..	..	..	112—98
20	..	..	..	..	114—84
40	..	..	..	..	122—90
29	..	..	..	..	128—90
40	..	..	..	..	124—96
35	..	..	..	..	128—100
38	..	..	..	..	118—96
45	..	..	..	..	110—86
34	..	..	..	..	116—88

Average, 119—92 mm. Hg.

(3) Early pigmentation with slight nutritional change.

Age					Blood-pressure
42	..	..	..	..	108—80
46	..	..	..	..	104—78
40	..	..	..	..	108—78
35	..	..	..	..	112—90
22	..	..	..	..	112—90
26	..	..	..	..	120—92
34	..	..	..	..	126—94
36	..	..	..	..	114—80
26	..	..	..	..	98—72

Average, 111—95 mm. Hg.

(6) A large proportion of the cases show helminthic and flagellate infections of the intestine. These cannot be considered causal factors but merely contributory to digestive disturbance and mal-nutrition.

(7) The disease produces loss of resistance to the invasion of bacterial and protozoal disease, and is therefore a contributory factor to a high rate of mortality.

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TABLE III.—BLOOD-PRESSURES AND ASSOCIATED SYMPTOMS OF 100 CASES OF EARLY PELLAGRA ADMITTED TO HOSPITAL DIRECT FROM TURKISH LINES.

Duration of disease in months	Nutrition	Diarrhoea	Mentality	Reflexes of:—			Blood pressure
				Abdomen	Arm	Leg	
6	Poor ..	Intermittent ..	N ..	N	N	N	112—70
15	Very poor ..	Present ..	Very dull ..	N	N	N	100—80
24	Poor ..	Nil ..	Fair ..	N	N	N	98—76
6	" ..	" ..	" ..	N	N	N	96—78
6	" ..	" ..	Dull ..	N	—	N	108—80
6	Good ..	" ..	Fair ..	N	O	N	92—70
6	Fair ..	" ..	Dull ..	N	—	N	92—74
12	Poor ..	" ..	" ..	N	N	..	80—60
12	Fair ..	" ..	Fair ..	N	N	N	98—74
2	Poor ..	" ..	Very dull ..	N	N	N	90—70
2	Fair ..	Intermittent ..	Dull ..	N	N	N	98—74
6	" ..	" ..	Fair ..	N	O	O	90—72
12	" ..	" ..	" ..	N	O	O	92—74
6	Good ..	" ..	Good ..	N	N	O	90—74
6	Fair ..	Nil ..	Fair ..	N	O	N	82—66
12	Poor ..	Intermittent ..	" ..	—	N	—	92—78
1	" ..	" ..	Very dull ..	N	—	N	90—78
12	" ..	Nil ..	Dull ..	N	—	N	98—72
24	" ..	Intermittent ..	Fair ..	N	N	N	88—68
6	" ..	" ..	" ..	N	N	N	100—78
2	" ..	Nil ..	Dull ..	N	N	..	88—70
4	" ..	" ..	" ..	—	O	—	80—65
6	" ..	Intermittent ..	N ..	N	N	N	102—78
12	" ..	Nil ..	Dull ..	N	N	N	86—60
4	Very poor ..	Intermittent ..	N ..	N	N	N	102—78
12	Fair ..	Nil ..	Dull ..	N	N	N	86—70
6	Poor ..	Constipation ..	Very dull ..	N	O	N	90—76
12	" ..	Nil ..	Dull ..	N	O	N	96—76
6	" ..	" ..	N ..	N	O	N	102—80
6	" ..	Present ..	Dull ..	N	O	N	90—70
6	" ..	Intermittent ..	Very dull ..	N	N	..	100—80
3	" ..	" ..	" ..	N	O	N	102—80
24	Very poor ..	" ..	" ..	O	O	—	82—68
12	Fair ..	" ..	Fair ..	O	—	O	92—70
3	Very poor ..	Nil ..	N ..	N	N	N	94—74
3	" ..	" ..	Good ..	N	N	N	94—70
12	Fair ..	" ..	" ..	N	N	N	84—68
12	Poor ..	" ..	" ..	N	O	N	92—76
6	" ..	" ..	Fair ..	N	..	N	99—80
3	" ..	" ..	Dull ..	N	O	N	100—72
12	" ..	" ..	" ..	N	O	N	98—80
4	" ..	" ..	" ..	O	O	N	80—65
12	" ..	Present ..	" ..	N	N	N	82—68
24	" ..	Nil ..	" ..	N	O	—	98—76
6	Very poor ..	" ..	Very dull ..	N	..	..	96—80
24	Fair ..	" ..	N ..	N	N	N	94—72
12	Poor ..	Present ..	Very dull ..	O	N	N	96—78
12	Fair ..	Nil ..	N ..	N	N	N	94—72
6	Good ..	" ..	Good ..	—	N	—	102—80
6	Very poor ..	Intermittent ..	Fair ..	N	N	—	98—70
24	Fair ..	" ..	Good ..	N	N	—	96—76
12	Very poor ..	Nil ..	Very dull ..	N	O	N	90—80
18	" ..	Present ..	" ..	O	N	N	84—64
18	Poor ..	Nil ..	Dull ..	N	—	—	86—66
6	Fair ..	Intermittent ..	" ..	N	N	N	100—80
6	Poor ..	" ..	" ..	N	N	N	92—72
4	Fair ..	" ..	N ..	N	N	N	98—80
6	Poor ..	" ..	Fair ..	O	O	N	110—90

N = Normal.

O = Absent.

TABLE III.—Continued.

Duration of disease in months	Nutrition	Diarrhoea	Mentality	Reflexes of:—			Blood-pressure
				Abdomen	Arm	Leg	
24	Very poor ..	Nil	N	N	O	—	90—72
6	" " ..	Present ..	Dull	N	—	—	90—70
4	" " ..	Intermittent ..	Very dull ..	N	N	N	82—60
8	Poor	Nil	Fair	N	—	N	92—76
6	Very poor ..	Intermittent ..	Very dull ..	N	..	..	90—70
8	Poor	Nil	Fair	N	—	—	108—88
6	Very poor ..	"	N	N	—	—	92—72
4	" " ..	"	Very dull ..	..	N	N	112—88
12	Fair	"	N	N	N	N	92—78
6	Very poor ..	"	Dull	N	N	..	97—72
12	Poor	Intermittent ..	"	O	N	N	100—88
12	Very poor ..	"	Very dull ..	N	N	N	78—62
3	" " ..	"	" " ..	O	..	..	102—82
4	" " ..	Nil	Dull	N	—	N	100—82
12	" " ..	"	Very dull ..	N	—	N	80—64
18	" " ..	Present ..	" " ..	N	—	—	85—65
4	Poor	Intermittent ..	N	N	—	—	100—88
24	Very poor ..	Nil	Dull	N	N	N	78—66
12	Fair	Present ..	Fair	—	N	O	88—74
7	" " ..	Nil	"	N	N	O	88—70
6	Very poor ..	"	Dull	N	..	N	92—78
24	Fair	"	Fair	N	N	N	112—90
6	" " ..	"	N	N	N	N	108—84
6	" " ..	Present ..	Fair	N	—	—	94—78
4	" " ..	Nil	"	N	N	N	110—84
3	Poor	"	N	N	N	N	84—64
6	" " ..	Intermittent ..	N	N	—	N	82—68
6	Very poor ..	"	Dull	N	N	N	102—80
12	Fair	Nil	N	N	N	N	92—68
12	" " ..	"	Dull	N	—	—	96—80
4	Poor	Intermittent ..	N	N	N	N	88—70
18	Very poor ..	Nil	Very dull ..	N	—	N	92—78
6	Poor	"	N	N	—	—	88—70
3	Good	Intermittent ..	N	N	N	N	90—72
6	Fair	Nil	Fair	O	N	N	92—74
6	" " ..	"	N	N	N	N	78—64
4	Poor	Intermittent ..	Dull	N	N	—	94—78
18	" " ..	Nil	Very dull ..	N	N	N	98—80
12	Very poor ..	"	" " ..	N	..	..	112—80
6	Poor	"	" " ..	N	N	N	98—80
6	Very poor ..	"	" " ..	N	N	N	90—80

Cases	Period since onset of first symptoms	Blood-pressure—Hg
59	Up to six months	94·54—74·9 mm.
27	Six to twelve months	90·90—72·7 ..

N = Normal.

O = Absent.

TABLE IV.—ADVANCED CASES OF PELLAGRA.

Diarrhoea	Blood- pressure*	Mentality	Reflexes	Complications	Result
Present ..	68—50	Dull ..	—	Amœbic dysentery	Improved
" ..	" ..	Very dull	+	"	Death
" ..	" ..	Dull ..	—	"	"
" ..	92—76	Very dull	—	Bacterial dysentery, trichomonas	Improved
" ..	94—80	Fair ..	—	"	"
" ..	" ..	Very dull	—	Ascaris, trichomonas	"
" ..	" ..	Fair ..	—	Nil	"
" ..	82—60	Very dull	—	Ascaris, trichomonas	"
" ..	80—62	Dull ..	N	Malignant malaria	Death
" ..	92—80	Very dull	N	Ascaris, ulcerative colitis ..	"
" ..	94—72	" ..	O	Colitis	"
Intermittent	82—64	N ..	—	"	"
Present ..	98—82	N ..	—	Acute bronchitis, pneumonia, amœbic dysentery	"
" ..	78—65	Very dull	+	Bacterial dysentery	"
" ..	" ..	" ..	—	Bronchitis, pneumonia, dysentery	"
" ..	96—72	Dull ..	—	"	"
Nil ..	104—88	" ..	+	Nil	Repatriated
Present ..	" ..	Very dull	N	"	"
Nil ..	" ..	Dull ..	+	"	"
Present ..	98—78	Very dull	N	Bacterial dysentery	"
" ..	" ..	Dull ..	—	"	"
" ..	88—70	Very dull	+	"	"
" ..	" ..	" ..	+	Dysentery	"
" ..	" ..	" ..	N	Bacterial dysentery, pneumonia	Death
" ..	99—80	" ..	O	Dysentery	"
" ..	" ..	" ..	+	Tuberculosis, peritonitis ..	"
" ..	90—72	N ..	+	Bronchitis	Improved
" ..	100—82	Very dull	+	Nil	"
" ..	105—88	" ..	+	"	"
Nil ..	90—74	Dull ..	+	"	"
Present ..	90—78	" ..	—	Amœbic dysentery	"
" ..	" ..	Very dull	—	Nil	"
" ..	86—70	" ..	N	Chronic dysentery	Death
" ..	" ..	" ..	—	Bacterial dysentery	"
" ..	88—70	" ..	+	Bacterial dysentery, lamblia, trichomonas	"
" ..	" ..	" ..	—	Bacterial dysentery	"
" ..	" ..	Dull ..	—	"	"
" ..	84—70	Very dull	—	"	"
" ..	" ..	Dull ..	—	Malaria	"
Nil ..	94—70	Fair ..	N	"	Improved
Intermittent	104—80	" ..	N	Malaria, ascaris	"
" ..	100—80	" ..	N	Nil	"
" ..	98—80	Very dull	N	"	"
Present ..	100—82	Dull ..	N	"	"
Intermittent	98—80	Very dull	—	Lamblia, blastocystis	"
Present ..	80—78	" ..	—	Amœbic dysentery	"
Nil ..	72—60	N ..	N	Nil	"
Intermittent	100—83	Fair ..	N	"	"
Present ..	88—70	Dull ..	—	Amœbic dysentery, trichiurus ..	"
" ..	" ..	" ..	—	Amœbic dysentery, blastocystis, ascaris, trichiurus	"
Intermittent	96—78	Very dull	N	Nil	Repatriated
Present ..	90—72	Fair ..	N	Bacterial dysentery anæmia ..	Improved
" ..	88—70	Dull ..	—	Amœbic dysentery	"

N = Normal.

O = Absent.

* Average of 36 = 91·3—74·0.

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TABLE V.—TABLE TO SHOW RECURRENCES, BLOOD-PRESSURE, MUSCLE TONE AND REFLEXES IN RECOVERED PELLAGRINS IN ARMENIAN REFUGEE CAMP, PORT SAID.

Age	Attacks	Blood pressure**	Muscle tone*	Reflexes			Nutrition	Pigmentation
				Knee*	Arm*	Plantar*		
30	1916-17-18	120—90	Good	N	N	N	Good	Hand, feet, face
21	1916-17-18	128—100	N	N	N	N	"	Hands
43	1918 ..	108—90	N	N	N	N	"	Hands and feet (lightly)
20	1916-17-18	122—100	Good	N	N	N	"	Face, hands and feet
20	1916-1918	150—100	"	N	N	N	"	Face and hands (lightly)
27	1916-17-18	122—94	"	N	N	N	"	Face (delicate batwing) hands marked; feet band from strap of shoe
35	1919-17 ..	138—118	N	N	N	N	Excellent	Hands and feet (deeply)
19	1916 ..	118—90	N	N	N	N	"	Hands and feet†
40	1916-17 ..	130—90	N	Sluggish	N	N	Fair	Hands and feet
24	1918 ..	118—90	N	N	N	N	Good	Face, hands and feet (lightly)
42	1916 ..	118—92	N	"	"	N	"	" " " (diffused)†

** Average 124·7—95·8.

* N = Normal.

† Melancholic.

‡ Pupil reflex normal.

(Signed) F. D. BOYD,
Colonel, A.M.S.

APPENDIX II.

BIOCHEMICAL INVESTIGATIONS RE PELLAGRA.

Carried out on prisoners of war at:—

Cairo No. 2 Prisoners of War Hospital and Heliopolis Camp.
East Kantara, Prisoners of War Camp.

SECTION A.—LOSS OF PROTEIN BY INTESTINAL PUTREFACTION.

The experiments of Hopkins and Willcocks in 1907 showed that zein, the chief protein of maize, was insufficient to keep rats alive. This defect was partly due to the absence of tryptophane from zein, as addition of tryptophane to the diet prolonged the lives of the rats.

In 1913 Sandwith suggested that a deficiency of tryptophane might be a factor in the causation of pellagra.

Recent work by various workers has shown the importance of individual amino-acids for weight maintenance and for growth. Failing sufficient information to estimate separately the amino-acids in protein, one must use as a gauge the results of metabolism experiments on man.

For some years Professor W. H. Wilson, of the Egyptian Government School of Medicine, has been using the biological value of protein in dealing with the protein of the diet as related to pellagra.

It is obvious that destruction of the rarer amino-acids, for example the bacterial putrefaction of tryptophane, must greatly decrease the value of protein in the diet. At Professor Wilson's suggestion I have investigated the extent to which tryptophane is destroyed by testing for potassium indoxyl sulphate (urinary indican) in the urine.

The potassium indoxyl sulphate was hydrolysed and oxydized to indigo by Obermeyer's reagent; the indigo was dissolved in chloroform and colorimetrically compared with dilutions of Fehling's solution, 5 cubic centimetres of Obermeyer's reagent, 5 cubic centimetres of urine, and 2 cubic centimetres of chloroform were used; the results are expressed as none, trace, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 or more than 1 of the colour of Fehling's solution.

As intestinal putrefaction depends on various factors, for instance, the length of time that the food remains in the intestine; complications such as dysentery will diminish the amount absorbed. The amount will vary from day to day, but the results of a large number of cases will show whether bacterial destruction of tryptophane is occurring to any extent.

(a) *Observations of Cases in Non-labour Camp and Hospital at Cairo.*

Table I shows results obtained in Cairo on various types of cases, from which it can be seen that definite pellagrins show an appreciable degree of bacterial destruction of protein.

TABLE I.—NUMBER OF CASES SHOWING VARIOUS AMOUNTS OF POTASSIUM INDOXYL SULPHATE IN THE URINE.

Colour as compared with Fehling's solution	0	Trace	1/64	1/32	1/16	1/8	1/4	1/2	1	More than 1	Total cases
Healthy Turks ..	67	25	6	4	1	1	0	0	0	0	104
Suspicious cases ..	9	2	1	1	1	2	0	0	0	0	16
Early cases ..	1	0	10	4	7	3	7	1	1	0	34
Active cases ..	4	4	1	3	6	5	5	3	2	2	34
Convalescent cases ..	0	0	1	1	1	0	0	0	0	0	3
Quiescent cases ..	36	20	19	4	5	9	11	1	0	0	105

Notes on Table I.

Healthy Turks ..	Cases from general compounds at Heliopolis Camp.
Suspicious cases ..	„ without any definite symptoms at Heliopolis Camp.
Early cases ..	„ with slight symptoms who were sent down the line, soon after capture, for immediate study.
Active cases ..	Hospital cases.
Convalescent cases ..	„ „ after improvement had commenced.
Quiescent cases ..	Definite pellagrins at Heliopolis Camp. These are kept in a separate compound on special diet and some are under treatment, but they have no active rash.

The suspicious cases, like the healthy Turks, show very little potassium indoxyl sulphate in their urine. The early, active and convalescent cases show a considerable amount; whilst those in the quiescent stage, as might be expected, are intermediate in degree. For convenience of comparison the early, active and convalescent cases are added together and the figures are expressed as percentages, thus:—

TABLE II.—PERCENTAGES OF CASES SHOWING VARIOUS AMOUNTS OF POTASSIUM INDOXYL SULPHATE IN THE URINE.

Colour as compared with Fehling's solution	0	Trace	1/64	1/32	1/16	1/8	1/4	1/2	1	More than 1
Healthy ..	64.3	24.0	5.8	3.8	1.0	1.0	0	0	0	0
Quiescent ..	34.3	19.0	18.1	3.8	4.7	8.6	10.6	0.9	0	0
Active, etc. ..	7.0	9.6	16.9	11.3	19.7	11.3	16.0	5.6	4.2	1.4
Totals of bracketed groups—										
Healthy ..	88.3		9.6		2.0		0		0	
Quiescent ..	53.3		21.9		13.3		11.4		0	
Active, etc. ..	12.6		28.2		31.0		22.5		5.6	

Note.—Certain of the above early cases were examined on two or more occasions and these examinations indicate that rest in hospital on a hospital diet causes a decrease in the amount of intestinal putrefaction.

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TABLE III.—SERIAL EXAMINATIONS OF URINE FOR POTASSIUM INDOXYL SULPHATE.

Examination during:	0	Trace	1/64	1/32	1/16	1/8	1/4	1/2	1	Cases examined
First period..	1	0	2	2	3	2	3	0	0	= 13
Second period ..	9	1	1	1	3	0	2	1	1	= 19
Third period ..	7	1	2	1	5	2	0	0	0	= 18

These results suggest that pellagra is associated with bacterial putrefaction in the intestine.

(b) *Observations on Cases in Labour Camp and Hospital at Kantara.*

In order to follow the subject farther back, some observations were made at Kantara on working prisoners on their ordinary diet. These men were mostly in an earlier stage than the cases in Table II, so one may classify them as pre-pellagroid, although the Medical Officers of the camps graded them for me as "healthy," and stage 1, 2, 3, 4, called by them "suspicious," "beginning," "definite" and "advanced," respectively.

TABLE IV.—AMOUNT OF INDIGO FROM URINE OF WORKING PRISONERS.

(a) *Numbers by Classes and Results.*

Class	0	Trace	1/64	1/32	1/16	1/8	1/4	1/2	Totals of cases
Healthy ..	32	8	7	4	3	3	2	0	59
Stage 1 ..	63	12	12	10	5	5	2	0	109
„ 2 ..	73	16	9	5	6	3	3	3	118
„ 3 ..	76	20	5	1	4	2	1	2	116
„ 4 ..	58	9	10	5	1	3	1	2	89
Totals ..	302	65	43	25	19	16	9	7	491

(b) *Percentage by Classes and Results.*

	55	13.5	11.6	6.8	5.1	5.1	3.4	0
Healthy ..	55	13.5	11.6	6.8	5.1	5.1	3.4	0
Stage 1 ..	58	11.1	11.1	9.2	4.6	4.6	1.8	0
„ 2 ..	62	13.6	7.6	4.2	5.1	2.5	2.5	2.5
„ 3 ..	66	17.2	4.2	5.1	3.4	1.6	0.9	1.6
„ 4 ..	65	10.1	11.2	5.6	1.1	3.4	1.1	2.3
Totals of bracketed groups—								
Healthy ..	67.5		18.7		10.2		3.4	
Stage 1 ..	69.1		20.3		9.2		1.8	
„ 2 ..	75.6		11.8		7.6		5.0	
„ 3 ..	83.2		9.3		5.0		2.5	
„ 4 ..	75.1		16.8		4.5		4.5	

These results show that the pre-pellagroid cases amongst the working prisoners at Kantara do not show any grading in the amount of potassium indoxyl sulphate in their urine corresponding to the clinical classification carried out amongst these prisoners.

SECTION B.—ACIDOSIS.

The presence of potassium indoxyl sulphate (urinary indican) in the urine was shown by Myers and Fine to be correlated with a decrease in the hydrochloric acid of the gastric juice in pellagrins. The deficiency of acid was associated, therefore, with bacterial putrefaction in the intestine.

These observations suggested that it was important to observe whether there

was any evidence of increased alkalinity in the body fluids, thus accounting for the deficiency of hydrochloric acid in the gastric juice.

The reaction of the body fluids was investigated in two ways, namely, (a) by estimation of the titratable acid and ammonia in the urine and (b) by testing the titratable alkali and acid of the blood serum in the presence of indicators. Ingestion of acids or their formation intra-corporeally removes a certain amount of fixed alkali from the body. As the alkali decreases, the formation of urea from ammonia is exhibited, thus leaving ammonia to neutralize some of the acid and sparing the fixed alkali of the body. Excess of alkali, on the other hand, causes a decrease in the amount of ammonia formation. Acidity titration was carried out by N/10 alkali in presence of phenolphthalein, and ammonia was estimated by the method of Malfatti.

The hydrogen-ion concentration was tested by means of indicators but the urines were mostly of the same hydrogen-ion concentration.

(a) *Urinary Estimations.*

Acidity and Ammonia of the Urine of "Early" Pellagra Cases.

TABLE V.

	Daily volume of urine	c.c. titratable acid to phenolphthalein	Ammonia in grammes
Average of twenty early cases ..	1,452 c.c.	466.2	1.0269

These cases show a slight evidence of acid intoxication, as the ammonia is slightly above normal (0.7 gramme) and the titratable acid is also slightly above normal. Whether this increase in the ammonia was due to the starvation before capture or to the pellagra from which they were suffering, requires further investigation.

*Acidity and Ammonia of the Urine of Mixed Hospital Cases.
Advanced Pellagra and Pulmonary Tuberculosis.*

TABLE VI.

(i) *Those on Ordinary Hospital Diet.*

Daily volume of urine	c.c. titratable acid to phenolphthalein	Ammonia in grammes	
780	280.8	0.6895	Pulmonary tuberculosis
1,570	332.8	0.5872	" "
970	208.6	0.9098	" "
330	145.2	0.8258	" "
Average 913 c.c.	241.8	0.7530	
1,200	316.8	0.3590	Well-marked pellagra
1,370	624.7	1.0999	" "
1,210	177.4	1.3658	" "
300	123.4	0.6719	" "
Average 1,020 c.c.	311.8	0.8741	
(ii) <i>Those on Milk Diet.</i>			
1,300	478.4	0.9782	Pulmonary tuberculosis
590	153.4	0.5285	" "
Average 945 c.c.	315.9	0.7524	

TABLE VI.—*continued.*

1,060	..	135.7	..	1.1888	Well-marked pellagra
1,085	..	156.2	..	0.9149	" "
800	..	83.2	..	0.7125	" "
1,200	..	62.4	..	0.7997	" "
580	..	111.4	..	0.7178	" "
Average 949 c.c.	..	109.8	..	0.8666	" "
<hr/>					
Average for pulmonary tuberculosis cases		266.5	..	0.7532	
Average for well-marked pellagra cases		210.8	..	0.8704	

(iii) *Complicated Cases of Pellagra.*

Daily volume of urine		c.c. titratable acid to phenolphthalein	Ammonia in grammes	Remarks
1,210	..	145.2	1.1589	Milk diet, HCl given
{ 220	..	134.6	0.5819	" Malaria
{ 300	..	147.6	0.4753	
{ 112	..	26.8	0.2178	" Sod. bic. given
{ 310	..	116.6	0.4132	
760	..	75.5	0.5426	" Bac. dys.
1,330	..	69.7	0.6954	" HCl given
1,110	..	48.8	0.4302	" Malaria
* { 121	..	32.0	0.1915	"
{ 190	..	98.8	0.3542	
620	..	198.4	†2.0490	
Average 571 c.c.	..	99.4	0.6554	

* The total urine obviously could not have been collected in this instance.

† Urine strongly ammoniacal. P.M. Surgical kidney, amebic dysentery, malarial spleen and amyloid liver were found.

Among these cases were some with remarkably small quantities of urine, yet the total ammonia was moderately high; this was due to the great concentration of ammonia in the urine.

(b) *Blood Estimations.*

The titrations of blood serum were carried out by the method of Moore and Wilson. The results were as follows:—

TABLE VII.

Class of case	Normality of serum to di-methyl-amino-azo-benzene	Number of cases
Healthy ..	0.167	6
Early pellagra ..	0.152	8
Well-marked pellagra..	0.150	4

Note.—The healthy cases correspond with the controls of Moore and Wilson but the pellagrins show a decrease in the fixed alkali of the blood serum.

* * * * *

The slight increase in ammonia in the urine, with the decrease in fixed alkali in the blood serum of pellagrous cases, points to a mild degree of acidosis. The number of cases is too small to warrant definite conclusions from these differences, but they may be confirmed by further work, especially on more acute cases.

Conclusions.

(1) That bacterial putrefaction of tryptophane is more frequent amongst pellagrins than amongst healthy individuals, this being a possible factor in causing or maintaining the disease by loss of amino-acid.

(2) There is some evidence that acidosis may be a metabolic accompaniment of pellagra.

(Signed) H. E. ROAF,
Captain, R.A.M.C.(T.F.).

December 30, 1918.

(To be continued.)

Reviews.

THE INTENSIVE TREATMENT OF SYPHILIS AND LOCOMOTOR ATAXIA BY AACHEN METHODS. By Reginald Hayes, M.R.C.S., etc. London: Baillière, Tindall and Cox. Third edition, revised, 1919. Pp. vii and 92. Price 4s. 6d.

This is a defence and an exposition of the art of treating syphilis by inunction which should be read by all syphilologists who contemplate employing this useful and too much neglected method. Too many imagine that inunction requires only the handing of a piece of mercurial ointment to the patient, with instructions to rub it into his groins, plaster it inside the soles of his socks, or to employ some equally ridiculous method of rubbing it in. Some of these do not hesitate later to compare inunction with other methods of treatment to the detriment of the former. For them the study of an excellent little work such as this is eminently necessary. They will learn here that to effect its purpose mercurial inunction must be performed by a well-trained, conscientious rubber and that precautions must be taken which make the method by no means so simple as some would represent it.

Dr. Hayes has a place for salvarsan and allied products in his treatment of syphilis, though it is natural that, regarding them as rivals of his favourite inunction, he should make the most of their limitations.

The work contains some clear instructions on the general management of patients undergoing the intensive mercurial inunction treatment which are valuable in the administration of mercury by other routes.

VENEREAL DISEASES. A PRACTICAL HANDBOOK FOR STUDENTS. By C. H. Browning, M.D., D.P.H., and David Watson, M.B., C.M. London: Henry Frowde, Hodder and Stoughton, 1919. Pp. xv and 336.

A practical handbook of Venereal Diseases written for students is a new departure. Such a book certainly is needed and we agree with the authors' statement in their preface, that a practical knowledge of venereal disease is essential to every student of medicine.

The great difficulty in compiling such a book is to decide what to include and what to omit. In a work which is designed for students who are new to the subject we should judge that the commoner details should be fully described and the rarer merely mentioned.

Judged by this standard we find this work wanting in a number of respects. All are agreed on the importance of the early diagnosis of venereal diseases on account, as the authors truly say, of their great amenability to treatment when they are attacked in the early stages as contrasted with their refractoriness later,

so we should have thought the different varieties of syphilitic chancre worthy of a fuller description and illustration than those accorded to the subject by the authors. Again, a clearer line of treatment is required by the beginner than the vague indication given here; for example, the authors say, "When the case is in the primary stage with negative Wassermann reaction, a full course consists of from six to twelve injections of salvarsan given at the rate of from one to two doses weekly," or, "If treatment is not begun until the secondary stage *several* courses of salvarsan medication at an interval of one to two months along with several series of mercurial injections are desirable." This is not very clear or helpful advice to the student. More definite instruction on these matters we should consider of far greater importance than the detailed description of tabes and general paresis and the localizing symptoms of brain tumours.

In the paragraph devoted to the contra-indications to the administration of salvarsan at least some definite information should be given as to the dangers of continuing with the treatment in patients who show intolerance to the arsenic preparations as manifested by urticaria, erythema and jaundice; to merely state that symptoms of hypersensitiveness "should be the warning to proceed carefully as regards *increase* of dosage" is advice which might be followed by very unpleasant results.

Again, in the paragraph on the Wassermann reaction in the control of treatment, the student will ask for more definite advice than a statement such as the following:—

"The Wassermann reaction should be tested at intervals of three to six months for some years after the cessation of treatment; more frequent tests may be advisable but are seldom practicable."

What we have said of the first section of the book applies also to the second on gonorrhœa, which we think might be more systematic and clear. For example, there is no reference to the necessity of a systematic examination before discharge from treatment—surely a very essential point—if for no other reason than the danger of spreading the disease.

We have pointed out what appear to us to be the weak points in the book, which, however, contains much that is excellent and of value to the student.

C. F. W.

HANDBOOK FOR THE WOMEN'S ROYAL AIR FORCE. London: Gale and Polden, Ltd., 1919. Pp. 152. Price 2s. 6d. net.

This interesting little Handbook begins with a brief history of aeronautics, from the first practical design for a flying machine made over a hundred years ago, down to the marvellous developments since 1900, as a result of the discovery of the petrol engine.

Perhaps the development of the Women's Service Corps would have been almost as astonishing to our grandmothers.

Before 1914 the very important duty of nursing the sick and wounded was the only service open to women. By 1915 there was a lack of cooks in the Army, and the Women's Legion was inaugurated to supply women cooks, and later waitresses and motor drivers for the Army.

In the autumn and winter of 1916, the man power problem was becoming acute. Investigation of the situation on the lines of communication showed that much work had to be done by soldiers which in civil life was frequently done by women, and in February 1917 the Army Council decided to constitute a body of women for service behind the lines in France. This body was known at first as the Women's Army Auxiliary Corps, later as Queen Mary's Army Auxiliary Corps, Her Majesty the Queen having honoured the Corps by becoming its Commandant. In July, 1917, units of the W.A.A.C. were detailed for service in the United Kingdom, and in 1918 a contingent was detailed for duty with the

American Expeditionary Force in France. Besides the great clerical and domestic branches, the workers included motor drivers, telephonists, telegraphists, sorters, bakers, gardeners, machinists, and mechanics of various kinds.

The Women's Royal Naval Service was formed in November, 1917, to facilitate the substitution of women for naval ranks and ratings in the Royal Navy and Royal Marines, as well as the Royal Naval Air Service. Besides domestic and clerical work, the women acted as signallers and wireless telegraphists, and much work of a technical nature was done in making mine mats, and wiring on the floats, making gas masks and depth charges, cleaning torpedoes and sail making.

The Women's Royal Air Force came into existence on April 1, 1918, when the Royal Air Force was formed by the amalgamation of the Royal Flying Corps and the Royal Naval Air Service. A considerable number of Q.M.A.A.C. and W.R.N.S. attached to flying units were transferred to form a nucleus. The greater number of women are clerks, cooks, orderlies and engaged in various other domestic occupations, but besides these there are dispatch riders, dopers, painters, acetylene-welders, carpenters, magneto-repairers, photographers, drivers, fabric workers employed on duty of all kinds, from the covering of aeroplane wings to the mending of the finest balloon silk.

The Handbook, besides a chapter on discipline, official correspondence, drill, games and recreation, has a chapter on camp sanitation and on camp cooking, and there is also an excellent section devoted to Hygiene and First-Aid.

The Corps is now being rapidly demobilized, and perhaps all the grinding hard work that was accomplished by these women in the dark days of war may soon be forgotten, but it is to be hoped that the women themselves, who have had this golden opportunity of national service, with its discipline and esprit de corps, may be influenced by these traditions for the rest of their lives.

A. M. R.

"THE WAR WORK OF THE Y.M.C.A. IN EGYPT." By Sir James W. Barrett, K.B.E., etc., Temporary Colonel, R.A.M.C. London, 1919: H. K. Lewis and Co., Ltd. Pp. xx and 212. Price 10s. 6d. net.

Many who have seen the splendid services rendered by the Y.M.C.A. to the Egyptian Expeditionary Force will be prompted to read this book under an impulse of gratitude and a vague sense of acknowledgment. Those who do so, expecting to find a dry-as-dust record of good works, will be agreeably surprised to find it not only an attractive presentation of what was there achieved but also an instructive presentation of advanced views on the association of sociological and physical development.

There will be many misconceptions less in the mind of the average reader after tracing the evolution of Y.M.C.A. from the "sincere, but comparatively narrow sectarian movement" of its earlier days to its present broad-minded policy of "providing for young men everything that is healthy in the way of social and physical recreation, or—if they prefer it—of intellectual cultivation."

The author then recounts, in most interesting detail, illustrated by extracts from reports and observations, how the initial difficulties were surmounted and an amazing variety of undertakings carried to success in pursuit of the policy of whole-hearted ministration to the moral and material needs of our army in the field. There is glamour in the account of how the workers shared the dangers—and casualties—of the force in Gallipoli and maintained their services from the Sudan to Syria, but a perhaps finer record still is embodied in the less striking efforts to minister to troops under conditions of temperature and tedium difficult of realization unless personally experienced. "In the 120 miles to the Nile there is not a living soul to be seen, not a beast nor a bird, not a single tree nor any blade of grass. Here, 130 miles from the nearest town, with no shade, no village and no shops, in this spot we have placed our Y.M.C.A. hut." Shade and comfort,

quiet, and the wherewithal for reading and writing, a small canteen and organized recreation—these represented the least imposing but not the least valuable service to our men.

At the other extreme we find set out the amazing diversity of undertakings at such central institutions as that at the Y.M.C.A. Club for soldiers at Cairo, with its average daily attendance of 1,600, in addition to the 3,000 accommodated in the open-air auditorium with some big attraction nightly. The value—moral, mental and physical—of those provisions for healthy men is obvious from a mere enumeration. Recreation was provided by swimming bath, aquatic sports, skating-rink, rink-hockey, billiards, chess, games, boxing, periodicals, plays, cinema-shows, concerts and entertainments. The more sober-minded found writing materials, a library, classes in languages, debates, lectures and devotional meetings. The hostel afforded an average of 150 men accommodation, baths, and guides while on leave, and provided some 1,900 meals a day for habitués of the club.

The sick were given games and entertainments, and taken for free outings when convalescent. The anxieties of many friends were set at rest by the Y.M.C.A. bureau of search for those with whom they had lost touch. Refreshments were served free to sick and wounded to the extent of over 100,000 meals.

Clubs were run for officers, and special centres were organized for Indian troops under Indian workers observing caste prejudices.

It is interesting to read the financial policy pronouncement, and the results amply justify the view that it was better to utilize funds as circulating capital to provide what the troops needed most, at moderate cost, than to distribute gifts and doles. After paying working expenses and salaries of £40 a year to workers, all profits of trading were devoted to the interests of those who served in the war. The balance-sheet to June, 1918, represented some £828,720, and its perusal should satisfy every contributor to the funds so administered.

To medical men perhaps the most instructive chapter is that devoted to a consideration of the training for work on combined sociological and physical improvement of town dwellers, as afforded by the courses of study at the American Y.M.C.A. College at Springfield. This, however, cannot be epitomized but must be left to the reader, who can hardly fail to be stirred by the possibilities thus indicated.

P. S. L.

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JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

AUGUST, 1919.

EXTRACTS FROM THE "LONDON GAZETTE."

War Office,
June 27, 1919.

His Majesty the King has been graciously pleased to approve of the following award to the undermentioned Officer in recognition of his gallantry and devotion to duty in the Field :—

AWARDED THE MILITARY CROSS.

Temp. Capt. John Campbell, M.B., Royal Army Medical Corps (Mesopotamia).

For conspicuous gallantry and devotion to duty north of Sherqat on October 27 and 28, 1918. He showed great skill and a total disregard of danger in tending the wounded under fire. On several occasions, owing to the intensity of the enemy's fire, he had to move his aid post, but in spite of all difficulties he managed to evacuate all cases successfully.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

Lord Chamberlain's Office,
St. James's Palace, S.W.
June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following appointments to the Most Honourable Order of the Bath, for services rendered in connexion with the War. Dated June 3, 1919 :—

To be additional Members of the Military Division of the Third Class, or Companions, of the said Most Honourable Order :—

Col. James Robert McMunn, C.M.G., late Royal Army Medical Corps.

Col. Claude Kyd Morgan, C.M.G. M.B., late Royal Army Medical Corps.

Lieut.-Col. and Brevet Col. Arthur Lisle Ambrose Webb, C.M.G., R.A.M.C.

Lieut.-Col. and Brevet Col. Sir Edward Scott Worthington, Kt., K.C.V.O., C.M.G., Royal Army Medical Corps.

CANADIAN FORCES.

Col. John Alexander Gunn, O.B.E., Canadian Army Medical Corps.

Col. Charles Fenwick Wylde, Canadian Army Medical Corps.

CHANCERY OF THE ORDER OF ST. MICHAEL AND ST. GEORGE.

Downing Street,
June 3, 1909.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give directions for the following appointments to the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with the War. Dated June 3, 1919 :—

To be additional Members of the Third Class, or Companions of the said Most Distinguished Order :—

Major-Gen. Robert Porter, C.B., M.B. (retired pay).

Lieut.-Col. Sir James Kingston Fowler, K.C.V.O., M.D., F.R.C.P., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. (Acting Colonel) Andrew Alexander Watson, D.S.O., Royal Army Medical Corps (Special Reserve).

Temp. Lieut.-Col. Percy William George Sargent, D.S.O., M.B., F.R.C.S., Royal Army Medical Corps.

Lieut.-Col. (Acting Colonel) Alexander Morrison McIntosh, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

CANADIAN FORCES.

Lieut.-Col. Allan Coats Rankin, Canadian Army Medical Corps.

Lieut.-Col. (Acting Colonel) William Thomas Morris Mackinnon, Canadian Army Medical Corps.

Lieut.-Col. Frederick Charles Bell, Canadian Army Medical Corps.

Lieut.-Col. Ervin Lockwood Stone, Canadian Army Medical Corps.

AUSTRALIAN FORCES.

Lieut.-Col. John Hubback Anderson, C.B.E., Australian Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire, for valuable services rendered in connexion with the War :

To be Commanders of the Military Division of the said Most Excellent Order :—

Temp. Lieut.-Col. Sir Robert Armstrong-Jones, M.D., F.R.C.P., F.R.C.S., Royal Army Medical Corps.

Lieut.-Col. (Temp. Colonel) Laurence James Blandford, M.D., Royal Army Medical Corps (Territorial Force).

Temp. Major and Brevet Col. Frederick Sadler Brereton, Royal Army Medical Corps.

Brevet Col. Abraham Walker Browne (retired pay), Royal Army Medical Corps.

Lieut.-Col. James Calvert, M.D., Royal Army Medical Corps (Territorial Force).

Temp. Col. Albert Carless, M.B., F.R.C.S., Army Medical Service.

Temp. Col. Sir Arthur Chance, F.R.C.P., F.R.C.S., Army Medical Service.

Lieut.-Col. and Brevet Col. Reginald James Cope Cottell (retired pay), Royal Army Medical Corps.

Temp. Lieut.-Col. Maurice Craig, M.D., F.R.C.P., Royal Army Medical Corps.

Major Philip George Easton, D.S.O., Royal Army Medical Corps.

Temp. Major (Temp. Lieut.-Col.) William Bickerton Edwards, O.B.E., Royal Army Corps (Territorial Force).

Capt. and Brevet Major (Acting Lieut.-Col.) Edward Hurry Fenwick, F.R.C.S., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Herbert French, M.D., F.R.C.P., Royal Army Medical Corps.

Lieut.-Col. and Brevet Col. Archibald Burns Gemmel, Royal Army Medical Corps (Territorial Force).

Temp. Hon. Lieut.-Col. Mervyn Henry Gordon, C.M.G., M.D., Royal Army Medical Corps.

Lieut.-Col. Sir Alfred Pearce Gould, K.C.V.O., M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Col. Robert Isaac Dalby Hackett, M.D., Royal Army Medical Corps, Reserve of Officers.

Lieut.-Col. and Brevet Col. Louis Kenneth Harrison, M.B., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. David Harvey, C.M.G., M.D., Royal Army Medical Corps.

Lieut.-Col. and Brevet Col. Herbert Pennell Hawkins, Royal Army Medical Corps (Territorial Force).

Temp. Lieut.-Col. Francis Robert Hill, M.B., Royal Army Medical Corps.

Temp. Major (Temp. Lieut.-Col.) Walter de Marchet Hill, Royal Army Medical Corps.

Col. Henry Halcro Johnston, C.B., M.D. (retired pay), late Royal Army Medical Corps.

Major-Gen. Oliver Richard Archer Julian, C.B., C.M.G., Army Medical Service.

Lieut.-Col. Charles Archibald Lees, Royal Army Medical Corps (Territorial Force).

Temp. Lieut.-Col. John Robert Lord, M.B., Royal Army Medical Corps.

Major and Brevet Lieut.-Col. Arthur Pearson Luff, M.D., Royal Army Medical Corps.

Lieut.-Col. and Brevet Col. Frank Marsh, F.R.C.S., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. James Fitzgerald Martin, C.M.G., Royal Army Medical Corps.

Temp. Lieut.-Col. George Edward Miles, Royal Army Medical Corps.

Lieut.-Col. and Brevet Col. Robert Reginald Heber Moore, M.D. (retired pay), Royal Army Medical Corps.

Lieut.-Col. and Brevet Col. Charles William Mansell Moullin, M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Temp. Col. Joseph Francis O'Carroll, M.D., Army Medical Service.

Col. Daniel O'Sullivan (retired pay), Army Medical Service.

Major and Brevet Lieut.-Col. Henry Jules Parry, D.S.O. (retired pay), Royal Army Medical Corps.

Temp. Col. John Herbert Parsons, D.Sc., M.B., F.R.C.S., Army Medical Service.

Temp. Lieut.-Col. Andrew Melville Paterson, M.D., F.R.C.S., Royal Army Medical Corps. (To date from February 12, 1919).

Lieut.-Col. Lancelot William Rolleston, M.B., Royal Army Medical Corps.

Temp. Hon. Lieut.-Col. Richard Gundry Rows, M.D., Royal Army Medical Corps.

Temp. Col. James Sherren, F.R.C.S., Royal Army Medical Corps.

Lieut.-Col. Peter Caldwell Smith, Royal Army Medical Corps (Territorial Force).

Temp. Hon. Lieut.-Col. Thomas Edward Knowles Stansfield, M.B., Royal Army Medical Corps.

Temp. Lieut.-Col. David George Thomson, M.D., Royal Army Medical Corps.

Col. Octavius Todd, M.B. (retired pay), late Royal Army Medical Corps.

Col. Charles Robert Tyrrell, C.B. (retired pay), late Royal Army Medical Corps.

Lieut.-Col. Francis Spring Walker, F.R.C.S., Royal Army Medical Corps.

Lieut.-Col. Sinclair White, M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. (Temp. Col.) Arthur Stanley Woodwark, C.M.G., M.D., Royal Army Medical Corps.

To be Officers of the Military Division of the said Most Excellent Order :—

Capt. (Acting Major) Adolphe Abrahams, Royal Army Medical Corps.

Major Michael David Ahern, Royal Army Medical Corps.

Major Frederick William Andrews, M.D., F.R.C.S., Royal Army Medical Corps.

Temp Lieut.-Col. Herbert George Ashwell, Royal Army Medical Corps.

Temp. Lieut.-Col. Gilbert Alex. Bannatyne, M.D., F.R.C.P., Royal Army Medical Corps.

Lieut.-Col. Henry Arthur Berryman (retired pay), Royal Army Medical Corps (Reserve of Officers).

Major and Brevet Lieut.-Col. Robert Alfred Bolam, M.D., Royal Army Medical Corps (Territorial Force).

Temp. Major Richard Harding Bremridge, M.B., Royal Army Medical Corps.

Capt. Arthur Brodie Hamilton Bridges, Royal Army Medical Corps.

Capt. Robert Cunyngham Brown, Royal Army Medical Corps.

Major George Robert Bruce, Royal Army Medical Corps (Special Reserve).

Major William Byam, Royal Army Medical Corps.

Temp. Major Edward Postle Gwyn Causton, Royal Army Medical Corps.

Temp. Major Oswald Challis, Royal Army Medical Corps.

Temp. Capt. (Acting Major) Bertram James Collingwood, Royal Army Medical Corps.

Major Martin Alfred Cooke, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Martin Percy Corkery, Royal Army Medical Corps.

Major Evan James Trevor Corv, Royal Army Medical Corps (Territorial Force).

Major Charles Crawley (retired pay), Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Ernest Nicholson Cunliffe, M.D., Royal Army Medical Corps (Territorial Force).

Temp. Lieut.-Col. William Richard Dawson, Royal Army Medical Corps.

Temp. Major James Arthur Devine, M.D., D.S.O., Royal Army Medical Corps.

Capt. (Acting Major) Robert Milne Dixon, M.D., Royal Army Medical Corps.

Lieut.-Col. Henry Peers Dimmock (retired pay), Indian Medical Service.

Temp. Capt. Percy William Dove, M.B., Royal Army Medical Corps.

Capt. Reginald Samuel Orme Dudfield, Royal Army Medical Corps (Territorial Force).

Major Albert Ehrmann, Royal Army Medical Corps (Territorial Force).

Capt. and Brevet Major Reginald Cheyne Elmslie, F.R.C.S., Royal Army Medical Corps (Territorial Force).

Capt. Arthur Henry Evans, Royal Army Medical Corps (Territorial Force).

Capt. (Acting Major) Charles Horace John Fagan, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Henry George Falkner, Royal Army Medical Corps (Territorial Force).

Temp. Major William Thomas Finlayson, Royal Army Medical Corps.

Major (Temp. Lieut.-Col.) Gordon William Fitzgerald, Royal Army Medical Corps (Territorial Force).

Capt. and Brevet Major Alexander Grant Russell, Royal Army Medical Corps (Territorial Force).

Capt. and Brevet Major Colin Charlwood Frye, Royal Army Medical Corps (Territorial Force).

Capt. Charles John Dickenson Gair, Royal Army Medical Corps (Territorial Force).

Capt. James Alison Glover, M.B., Royal Army Medical Corps.

Capt. Frederick Lucien Golla, M.B., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Edward Wilberforce Goodall, M.D., Royal Army Medical Corps (Territorial Force).

Temp. Capt. Aubrey Goodwin, Royal Army Medical Corps.

Major Alexander Charles Edward Gray, M.D., Royal Army Medical Corps.

Capt. and Brevet Major (Acting Lieut.-Col. Robert Lyall Guthrie, M.D., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Michael Leo Hearn (retired pay), Royal Army Medical Corps.

Temp. Hon. Major Thomas Guy Macauley Hine, Royal Army Medical Corps.
 Temp. Major William Edward Home, Royal Army Medical Corps.
 Capt. Ernest Cranmer Hughes, F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Temp. Major (Acting Lieut.-Col.) Arthur Frederick Hurst, Royal Army Medical Corps.
 Qmr. and Capt. Ernest Janes, Royal Army Medical Corps.
 Capt. George John Jenkins, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Major (Acting Lieut.-Col.) Ernest Browning Lathbury, Royal Army Medical Corps.
 Major John Robert Lee, M.D., F.R.C.S., Royal Army Medical Corps.
 Temp. Hon. Lieut.-Col. Peter Macdiarmid, M.D., Royal Army Medical Corps.
 Capt. Angus G. Macdonald, M.D., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Donald Keith McDowell, C.M.G., Royal Army Medical Corps.
 Capt. (Temp. Major) Eric Francis Wallace Mackenzie, M.C., Royal Army Medical Corps.
 Major and Brevet Lieut.-Col. Andrew McMunn, Royal Army Medical Corps.
 Capt. Arthur Griffith Maitland-Jones, M.C., Royal Army Medical Corps.
 Hon. Capt. Charles Henry Milburn, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) George Wardlaw Milne, Royal Army Medical Corps.
 Temp. Lieut.-Col. Arthur Brownlow Mitchell, Royal Army Medical Corps.
 Temp. Major John Smythe Morrow, M.D., Royal Army Medical Corps.
 Capt. John Muir, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. Everitt George Dunne Murray, Royal Army Medical Corps.
 Temp. Capt. William Alfred Murray, M.B., Royal Army Medical Corps.
 Lieut.-Col. Robert James William Oswald, Royal Army Medical Corps (Territorial Force).
 Lieut.-Col. Christopher Thackray Parsons, M.D., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Daniel Wells Patterson, M.B., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. Alfred Cleveland Pickett, Royal Army Medical Corps.
 Major William Rattray Pirie, Royal Army Medical Corps (Territorial Force).
 Major George Newton Pitt, M.D., Royal Army Medical Corps (Territorial Force).
 Major (Acting Lieut.-Col.) Thomas James Potter, Royal Army Medical Corps.
 Temp. Lieut.-Col. Seton Sidney Pringle, Royal Army Medical Corps.
 Temp. Lieut.-Col. William Thomas Prout, C.M.G., M.B., Royal Army Medical Corps.
 Temp. Major Francis Carmichael Purser, Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Brownlow Riddell, M.D., Royal Army Medical Corps (Territorial Force).
 Capt. Robert Pugh Rowlands, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Major and Brevet Lieut.-Col. Charles Rundle, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) Thomas Russell, Royal Army Medical Corps (Territorial Force).
 Capt. Thomas Sheedy, Royal Army Medical Corps (Special Reserve).
 Capt. (Acting Major) George William Shore, Royal Army Medical Corps (Territorial Force).
 Major Arthur Briton Smallman, D.S.O., M.D., Royal Army Medical Corps.
 Lieut.-Col. Julian Carter Carrington Smith, M.B., Indian Medical Service.
 Major Walter George Spencer, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Major Arthur Clement Stamberg, M.D., Royal Army Medical Corps.
 Lieut.-Col. Alexander Brodie Seton Stewart, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) William Harle Stott, Royal Army Medical Corps.
 Major Russell Henry Jocelyn Swan, M.B., F.R.C.S., Royal Army Medical Corps.
 Capt. (Acting Major) James Taylor, Royal Army Medical Corps.
 Capt. David Thomson, M.B., Royal Army Medical Corps.
 Lieut.-Col. James Tidbury, M.D., retired pay, Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Henry William Marrett Tims, M.D., Royal Army Medical Corps.
 Qmr. and Capt. Alexander Gray Todd, Royal Army Medical Corps.
 Lieut.-Col. Frederick Sherman Toogood, M.D., Royal Army Medical Corps.
 Temp. Lieut.-Col. Paul Cunningham Edward Tribe, Royal Army Medical Corps.
 Temp. Capt. and Brevet Major William John Tulloch, Royal Army Medical Corps.
 Temp. Lieut.-Col. William James Nathaniel Vincent, M.D., Royal Army Medical Corps.
 Temp. Capt. Henry Holman Weekes, Royal Army Medical Corps.
 Temp. Capt. (Acting Lieut.-Col.) Charles James West, M.D., Royal Army Medical Corps.
 Lieut.-Col. Richard Melbourne West, D.S.O., Royal Army Medical Corps (Territorial Force).
 Hon. Lieut.-Col. Ernest William White, M.B., Royal Army Medical Corps.
 Temp. Capt. Ernest Ulysses Williams, Royal Army Medical Corps.
 Temp. Major Stanley Walter Williams, Royal Army Medical Corps.
 Temp. Major James Cowan Woods, M.D., Royal Army Medical Corps.
 Temp. Major Sydney Winslow Woollett, Royal Army Medical Corps.
 Major Reginald Worth, M.B., Royal Army Medical Corps.
 Temp. Capt. Ernest Dixon Wortley, Royal Army Medical Corps.
 Temp. Lieut.-Col. William Wrangham, M.D., Royal Army Medical Corps.
 Major Maurice Beresford Wright, M.D., Royal Army Medical Corps.
 Temp. Major Walter Perceval Yetts, Royal Army Medical Corps.
 Lieut.-Col. John Robert Yourdi, M.B. (retired pay), Royal Army Medical Corps.

To be Members of the Military Division of the said Most Excellent Order :—

Capt. (Acting Major) Cyril Armstrong, M.B., Royal Army Medical Corps (Special Reserve).
 Capt. Arthur George Atkinson, Royal Army Medical Corps (Territorial Force).
 Temp. Major Albert Edward Barnett, (Special List), Royal Army Medical Corps.
 Major Richard Brodie, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Stanley Brown, Royal Army Medical Corps.
 Capt. (Acting Major) Eustace Norman Butler, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. James Bayley Butler, Royal Army Medical Corps.
 Capt. (Acting Major) Charles Holt Caldicott, M.B., Royal Army Medical Corps (Territorial Force).
 Qmr. and Capt. Thomas Duncan Cameron, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) James Henry Crane, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. John Caldwell Fergusson, M.C., Royal Army Medical Corps.
 Temp. Qmr. and Capt. William Graham Lawson Fitchett, Royal Army Medical Corps.
 Capt. (Acting Major) Bertram Maughan Footner, Royal Army Medical Corps (Territorial Force).

Serjt.-Major Sydney Gallie, Royal Army Medical Corps.
 Temp. Capt. Andrew Grant, M.B., Royal Army Medical Corps.
 Temp. Capt. Walter Groome, Royal Army Medical Corps.
 Temp. Capt. Worsley John Harris, Royal Army Medical Corps.
 Temp. Qmr. and Capt. Thomas Hedley, Royal Army Medical Corps.
 Temp. Capt. Reginald Johnson, M.D., Royal Army Medical Corps.
 Temp. Lieut.-Col. John Keay, Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Charles Matheson Kennedy, F.R.C.S., Royal Army Medical Corps.
 Qmr. and Lieut. Charles Kingston, Royal Army Medical Corps.
 Qmr. and Capt. Albert Arthur Lippold, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. James Matthew O'Brien, West African M.C.
 Lieut.-Col. Edwin Quayle, Royal Army Medical Corps (Lanc. Vol.).
 Major and Brevet Lieut.-Col. David Rennet, M.D., Royal Army Medical Corps (Territorial Force).

Capt. (Acting Major) Oswald Clive Graeme Shield, M.B., Royal Army Medical Corps.
 Capt. (Acting Major) Lockhart James Spence, M.B., Royal Army Medical Corps.
 Capt. (Temp. Major) Walter Ernest Squire, Royal Army Medical Corps.
 Temp. Major Archibald Stodart-Walker, M.B., F.R.C.P., Royal Army Medical Corps.
 Capt. Arthur Henry Thomas, M.B., Royal Army Medical Corps.
 Capt. (Acting Major) Frederick John Thorne, M.B., Royal Army Medical Corps.
 Temp. Qmr. and Capt. John Tomkinson, Royal Army Medical Corps.
 Major Henry Smith Webb, Royal Army Medical Corps.

CANADIAN FORCES.

To be Commanders of the Military Division of the said Most Excellent Order :—

Col. John George Adami, Canadian Army Medical Corps.
 Col. James Whiteside Bridges, Canadian Army Medical Corps.
 Lieut.-Col. Ernest Rudolf Brown, Canadian Army Medical Corps.
 Col. Perry Gladstone Goldsmith, Canadian Army Medical Corps.
 Col. James Alexander Hutchinson, Canadian Army Medical Corps.
 Temp. Col. Walter McKeown, Canadian Army Medical Corps.
 Col. Herman Melchier Robertson, Canadian Army Medical Corps.

To be Officers of the Military Division of the said Most Excellent Order :—

Major Stanley Gordon Chown, Canadian Army Medical Corps.
 Lieut.-Col. Cole Edward Cooper Cole, Canadian Army Medical Corps.
 Lieut.-Col. Henry Charles Schomberg Elliott, Canadian Army Medical Corps.
 Major Sir Andrew MacPhail, Canadian Army Medical Corps.
 Lieut.-Col. Edward George Mason, Canadian Army Medical Corps.
 Temp. Capt. (Acting Major) John James Thomson, Canadian Army Medical Corps (C.E.F.).
 Lieut.-Col. David Alexander Whitton, Canadian Army Medical Corps.
 Lieut.-Col. Robert Elmer Wodehouse, Canadian Army Medical Corps.

To be Members of the Military Division of the said Most Excellent Order :—

Qmr. and Hon. Capt. John Hutcheson, Canadian Army Medical Corps.
 Temp. Capt. John Howard Slayter, Canadian Army Medical Corps.
 Qmr. and Hon. Major Edwin Sydney Woodiwiss, Canadian Army Medical Corps.

AUSTRALIAN IMPERIAL FORCES.

To be Commanders of the Military Division of the said Most Excellent Order :—

Col. Reginald Jeffrey Millard, C.M.G., Australian Army Medical Corps.
 To be Officers of the Military Division of the said Most Excellent Order :—
 Major Alexander Cook, Australian Army Medical Corps.
 Lieut.-Col. Charles Edgar Dennis, Australian Army Medical Corps.

Major Norman Maxwell Gibson, Australian Army Medical Corps.
 Major (B. Lieut.-Col.) Lewis Wilmer Jeffries, D.S.O., Australian Army Medical Corps.
 Lieut.-Col. Glen Alburn William James Knight, Australian Army Medical Corps.
 Major John Macdonald, Australian Army Medical Corps.
 Lieut.-Col. Hugh Corbett Taylor Young, Australian Army Medical Corps.

To be Members of the Military Division of the said Most Excellent Order :—
 Qmr. and Hon. Lieut. Arthur Charlesworth, Australian Army Medical Corps.
 Qmr. and Hon. Capt. John Raymond Drummond, Australian Army Medical Corps.
 Qmr. and Hon. Capt. John Francis Stuart Murray, M.C., Australian Army Medical Corps.

NEW ZEALAND FORCES.

To be Commanders of the Military Division of the said Most Excellent Order :—
 Lieut.-Col. Hugh Thomas Dyke Acland, C.M.G., F.R.C.S., New Zealand Medical Corps.
 Lieut.-Col. Alexander Robertson Falconer, New Zealand Medical Corps.
 Lieut.-Col. George Edward Gabites, New Zealand Medical Corps.
 Lieut.-Col. John Patrick Daunt Leahy, New Zealand Medical Corps.
 Lieut.-Col. Robert Haldane Makgill, New Zealand Medical Corps.
 Lieut.-Col. James Herbert Graham Robertson, New Zealand Medical Corps.

To be Officers of the Military Division of the said Most Excellent Order :—
 Lieut.-Col. Philip Oywalk Andrew, New Zealand Medical Corps.
 Major Cyril Victor Baigent, M.B., New Zealand Medical Corps.
 Lieut.-Col. Henry Ferdinand Bernau, New Zealand Medical Corps.
 Major Frederick Thompson Bowerbank, M.D., New Zealand Medical Corps.
 Major Edmund Harry Colbeck, M.D., New Zealand Medical Corps.
 Cant. (Temp. Major) David Eardley Fenwick, M.D., New Zealand Medical Corps.
 Major George Ernest Oswald Fenwick, F.R.C.S., New Zealand Medical Corps.
 Lieut.-Col. Alexander Wilson Hogg, New Zealand Medical Corps.
 Major Arnold Woodford Izard, M.D., New Zealand Medical Corps.
 Lieut.-Col. William Little, New Zealand Medical Corps.
 Major Eric Lachlan Marchant, New Zealand Medical Corps.
 Major Henry Percy Pickerill, M.D., New Zealand Medical Corps.
 To be Members of the Military Division of the said Most Excellent Order :—
 Capt. David Nathan Isaacs, New Zealand Medical Corps.
 Lieut. William Jack, New Zealand Medical Corps.
 Capt. Edward Cronin Lowe, New Zealand Medical Corps.
 Major William Haddon Pettit, New Zealand Medical Corps.

SOUTH AFRICAN FORCES.

To be Commanders of the Military Division of the said Most Excellent Order :—
 Col. Philip Graham Stock, C.B., M.B., South African Army Medical Corps.
 To be Officers of the Military Division of the said Most Excellent Order :—
 Major Harry Cecil Baker, South African Army Medical Corps.
 Temp. Major (Acting Lieut.-Col.) Harry Hyndman Balfour, M.B.E., South African Army Medical Corps.
 Temp. Lieut.-Col. David Horwich, South African Army Medical Corps.
 Temp. Lieut.-Col. Raymond Maxwell, South African Army Medical Corps.
 Major Francis Napier, South African Army Medical Corps.
 Temp. Lieut.-Col. Herbert John Orford, South African Army Medical Corps.
 Capt. Robert Derwent Parker, South African Army Medical Corps.
 Temp. Lieut.-Col. Charles Porter, South African Army Medical Corps.
 Major James Charles Alexander Rigby, M.B., South African Army Medical Corps.
 To be Members of the Military Division of the said Most Excellent Order :—
 Capt. Gerald Spencer Coghlan, South African Army Medical Corps.
 Qmr. and Hon. Lieut.-Col. George Merritt, South African Army Medical Corps.

NEWFOUNDLAND FORCES.

To be Officers of the Military Division of the said Most Excellent Order :—
 Major Lamont Patterson, M.D., Headquarters Staff Newfoundland.

War Office.
 June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the undermentioned awards for valuable services rendered in connexion with the War, dated June 3, 1919 :—

To be Brevet Lieutenant-Colonel :—

(On Retired List, Reserve of Officers, Special Reserve, New Army, or Territorial Force, in the case of Officers belonging to these categories, as applicable.)

Major (Temp. Lieut.-Col.) F. J. Brown, retired pay, Reserve of Officers, late Royal Army Medical Corps.

Major A. J. Chambers, retired pay, Reserve of Officers, late Royal Army Medical Corps.
 Major W. McA. Eccles, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Temp. Major S. Fleming, M.B., Royal Army Medical Corps.
 Major R. F. Hamilton, retired pay, late Royal Army Medical Corps.
 Major R. W. W. Henry, M.D., Royal Army Medical Corps (Territorial Force).
 Temp. Major L. E. Lanyon-Owen, Royal Army Medical Corps.
 Major H. A. Leebody, M.D., Royal Army Medical Corps (Territorial Force).
 Major (Acting Lieut.-Col.) E. J. Maclean, M.D., Royal Army Medical Corps (Territorial Force).
 Temp. Major A. W. Robertson, Royal Army Medical Corps.
 Major H. Skelding, M.B., Royal Army Medical Corps (Territorial Force).
 Major W. C. Smales, D.S.O., Royal Army Medical Corps.
 Temp. Major T. R. St. Johnston, Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) R. T. Turner, M.D., Royal Army Medical Corps (Territorial Force).
 Major Sir H. F. Waterhouse, Kt., M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

SOUTH AFRICAN FORCES.

Major M. G. Pearson, O.B.E., M.B., F.R.C.S., South African Medical Corps.
 Temp. Major T. L. L. Sandes, O.B.E., M.D., South African Medical Corps.

HOME SERVICES.

To be Brevet Major :—

(On Retired List, Reserve of Officers, Special Reserve, New Army, or Territorial Force, in the case of Officers belonging to these categories as applicable.)

Capt. W. Brander, M.D., Royal Army Medical Corps, Territorial Force Reserve.

Capt. (Acting Major) W. R. Bristow, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Capt. H. C. Dent, Reserve of Officers, Army Medical Service.

Capt. H. S. Dickson, Royal Army Medical Corps.

Temp. Capt. J. S. Dunn, M.D., Royal Army Medical Corps.

Capt. (Acting Major) C. M. Fegan, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) W. Fell, M.D., Royal Army Medical Corps.

Temp. Capt. A. E. Giles, M.D., F.R.C.S., Royal Army Medical Corps.

Capt. A. W. Howlett, M.B., Royal Army Medical Corps.

Capt. G. H. Hunt, M.B., Royal Army Medical Corps (Territorial Force).

Capt. R. A. Peters, M.C., M.B., Royal Army Medical Corps (Special Reserve).

Temp. Capt. (Acting Major) W. E. P. Phillips, Royal Army Medical Corps.

Temp. Capt. W. B. Purchase, M.C., Royal Army Medical Corps.

Capt. (Acting Major) B. Shires, M.B., Royal Army Medical Corps (Special Reserve).

Temp. Capt. W. S. Stalker, M.D., Royal Army Medical Corps.

Capt. E. S. Winter, Royal Army Medical Corps (Territorial Force).

The undermentioned Officers to be promoted under Articles 33a and 381 of the Royal Warrant :—

To be Lieutenant-Colonel :—

Qmr. and Major A. J. Chalk, Royal Army Medical Corps.

Qmr. and Major F. Crookes, D.C.M., Royal Army Medical Corps.

Qmr. and Major H. Johnson, Retired Pay, Royal Army Medical Corps.

Qmr. and Major H. Spackman, Royal Army Medical Corps.

Qmr. and Major H. Wooley, Royal Army Medical Corps.

To be Major :—

Qmr. and Capt. J. Clark, Royal Army Medical Corps.

To be granted the next higher rate of pay under the provisions of the Royal Warrant :—

Temp. Qmr. and Capt. J. Ferraro, Royal Army Medical Corps.

Temp. Qmr. and Capt. F. S. Marsland, D.C.M., Royal Army Medical Corps.

Temp. Qmr. and Capt. H. Porter, Royal Army Medical Corps.

Qmr. and Capt. H. H. Ross, Royal Army Medical Corps (Territorial Force).

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Warrant Officers, Non-commissioned Officers and Men in recognition of valuable services rendered in connexion with the war :—

ROYAL ARMY MEDICAL CORPS.

481003 Temp. Serjt.-Major B. G. Clarke (Cambridge).

481004 Temp. Serjt.-Major C. Constable (Cambridge).

29658 Temp. Serjt.-Major E. J. Downs (Crowe).

517001 Temp. Serjt.-Major W. H. Ford (Wood Green).

17736 Temp. Serjt.-Major J. D. Keeble (Alton).

15955 Temp. Serjt.-Major H. C. Miller (Southampton).

515028 Temp. Serjt.-Major C. F. Palmer (Tottenham).

5018 Serjt.-Major F. S. Parton (Rye).

408032 Temp. Serjt.-Major A. R. Reilly (Leeds).

32157 Serjt.-Major H. J. Stacy (Swansea).
 424056 Temp. Serjt.-Major J. C. Walker (Lincoln).
 344002 Serjt.-Major W. E. S. Waring (Liverpool).
 12582 Serjt.-Major J. Whiting (Henley-on-Thames).
 27359 Qmr.-Serjt. R. H. Croose (Manor Park).
 393004 Qmr.-Serjt. (Acting Serjt.-Major) E. J. Forster (Newcastle).
 16289 Qmr.-Serjt. (Acting Serjt.-Major) C. G. Hearn (Southsea).
 26109 Qmr.-Serjt. T. Lee (Bolton).
 481001 Qmr.-Serjt. H. S. Manning (Cambridge).
 33408 Qmr.-Serjt. (Acting Serjt.-Major) F. W. Murch (Walthamstow).
 26882 Qmr.-Serjt. C. Pitkin (Northampton).
 541048 Qmr.-Serjt. (Acting Serjt.-Major) C. E. Smith (Fulham).
 26117 Qmr.-Serjt. E. H. Stevens (Walthamstow).
 9711 Staff-Serjt. W. Brocklesby (Hull).
 1868 Staff-Serjt. (Acting Serjt.-Major) E. B. Browne (Glasgow) (India).
 25471 Staff-Serjt. (Acting Qmr.-Serjt.) J. C. Chesterman (Sheerness).
 184 Staff-Adj't. (Acting Qmr.-Serjt.) I. B. Dodd (Ashton-under-Lyme).
 9618 Staff-Serjt. J. Hall (Manchester).
 330016 Staff-Serjt. E. Kelly (Edinburgh).
 67781 Staff-Serjt. (Acting Qmr.-Serjt.) C. H. J. Locke (Walthamstow).
 19980 Staff-Serjt. H. J. Loder (Hong Kong).
 105317 Staff-Serjt. A. Wheeldon (Liverpool).
 9718 Serjt. W. J. Abbott (Hackney).
 8699 Serjt. (Acting Staff-Serjt.) W. E. Chettleburgh (F. Norwich).
 59243 Serjt. (Acting Serjt.-Major) J. Johnston (Motherwell) (Malta).
 29013 Serjt. (Acting Staff-Serjt.) S. G. Rhodes (Canterbury).
 40112 Serjt. (Acting Serjt.-Major) A. Hope (Rusholme).
 19997 Serjt. (Acting Serjt.-Major) R. J. Tilby (Borough).
 67932 Serjt. H. B. Treherne (Canonbury).
 8812 Serjt. (Acting Staff-Serjt.) W. B. Watson (Liverpool).
 55547 Cpl. (Acting Serjt.) J. A. Fraser (Large) (India).
 473543 Pte. (Acting Staff-Qmr.-Serjt.) H. Abel (Norwich).
 61688 Pte. (Acting Staff-Qmr.-Serjt.) J. M. Aitken (Glasgow).
 104318 Pte. (Acting Serjt.) A. W. J. Denny (East Ham).
 9111 Pte. S. Jones (Liverpool).
 104441 Pte. (Acting Serjt.) W. Kershaw (Rochdale).
 101510 Pte. (Acting Qmr.-Serjt.) C. Lambert (F. Heylake).
 16253 Pte. (Acting Cpl.) J. H. Pilling (Fort George).
 16809 Pte. (Acting Serjt.) A. E. H. Riding (Plumstead) (Singapore).
 16242 Pte. A. Porter (Worcester).
 388543 Pte. (Acting Cpl.) N. C. Storey (Newcastle).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

Lord Chamberlain's Office,
 St. James's Palace, S.W.
June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give orders for the following appointments to the Most Honourable Order of the Bath for valuable services rendered in connexion with military operations in France and Flanders, dated June 3, 1919:—

To be Additional Members of the Military Division of the third class, or Companions of the said most Honourable Order:—

Temp. Col. (Lieut.-Col.) William Pasteur, C.M.G., F.R.C.P., Royal Army Medical Corps (Territorial Force).

Col. Stevenson Lyle Cummins, C.M.G., M.D., late Royal Army Medical Corps.

Col. Hubert Alaric Bray, C.M.G., late Royal Army Medical Corps.

Col. Robert James Blackham, C.M.G., C.I.E., D.S.O., M.D., R.F.P.F., late Royal Arm Medical Corps.

Lieut.-Col. (Acting Col.) Harold Collinson, C.M.G., D.S.O., M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

AUSTRALIAN FORCE.

Col. George Walter Barber, C.M.G., D.S.O., Australian Army Medical Corps.

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,
June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give directions for the following appointments to the Most Distinguished Order of Saint Michael and Saint George for services rendered in connexion with military operations in France and Flanders, dated June 3, 1919:—

To be Additional Members of the third class, or Companions, of the said Most Distinguished Orders :—

Major-Gen. John Joseph Gerrard, C.B., M.B.

Major-Gen. James Thomson, C.B., M.B., Army Medical Service.

Lieut.-Col. William Thorburn, C.B., M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Seymour Gilbert Barling, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. (Acting Col.) Edwin Charles Montgomery-Smith, D.S.O., Royal Army Medical Corps (Territorial Force).

Temp. Lieut.-Col. Claude Gordon Douglas, M.C., M.B., Royal Army Medical Corps.

Major and Brevet Lieut.-Col. Cuthbert Garrard Browne, D.S.O., Royal Army Medical Corps.

AUSTRALIAN FORCE.

Lieut.-Col. (Temp. Col.) Thomas Peel Dunhill, Australian Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.,

June 3, 1919.

The King has been graciously pleased on the occasion of His Majesty's birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire for valuable services rendered in connexion with military operations in France :—

To be Commanders of the Military Division of the said Most Excellent Order :—

Col. John Donald Alexander, D.S.O., M.B., late Royal Army Medical Corps.

Col. Frank Warburton Begbie, late Royal Army Medical Corps.

Col. Willfred William Ogilvy Beveridge, C.B., D.S.O., M.B., late Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) Arthur Winniett Nunn Bowen, D.S.O., Royal Army Medical Corps.

Major (Temp. Major-Gen.) Sir John Rose Bradford, K.C.M.G., C.B., Royal Army Medical Corps (Territorial Force).

Temp. Major and Acting Lieut.-Col. William Philip Sutcliffe Branson, M.D., M.B., F.R.C.P., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) Bernard Bruce Burke, D.S.O., Royal Army Medical Corps.

Capt. (Temp. Col.) Harold Burrows, O.B.E., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. and Brevet Col. James Paul Bush, C.M.G., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Eustace Maude Callender, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. (Temp. Col.) John Hay Campbell, D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) John Clay, M.B., M.R.C.S., Royal Army Medical Corps (Territorial Force).

Temp. Major (Acting Lieut.-Col.) Robert Higham Cooper, Royal Army Medical Corps.

Lieut.-Col. and Brevet Col. William L'Estrange Eames, C.B., Royal Army Medical Corps.

Temp.-Col. Thomas Renton Elliott, D.S.O., Army Medical Dept.

Lieut.-Col. (Acting Col.) Otto William Alexander Elsner, D.S.O., Royal Army Medical Corps.

Capt. and Brevet Major (Acting Col.) Claude Howard Stanley Frankau, D.S.O., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. (Temp. Col.) Thomas Fraser, D.S.O., M.B., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Lieut.-Col.) Forbes Fraser, Royal Army Medical Corps.

Col. Thomas Wykes Gibbard, C.B., K.H.S., late Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) George Mills Goldsmith, Royal Army Medical Corps.

Col. Henry William Grattan, D.S.O., late Royal Army Medical Corps.

Major (Temp. Lieut.-Col.) Archibald Montague Henry Gray, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) John Robinson Harper, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Edwin Charles Hayes, Royal Army Medical Corps.

Lieut.-Col. Frederick William Higgs, Royal Army Medical Corps (Territorial Force).

Temp. Lieut.-Col. Gordon Morgan Holmes, C.M.G., M.B., Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) Cyril Henry Howkins, D.S.O., Royal Army Medical Corps (Territorial Force).

Col. Wilfred Edward Hudleston, C.M.G., D.S.O., late Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) Dermot Owen Hyde, D.S.O., Royal Army Medical Corps.

Major and Brevet Lieut.-Col. (Temp. Lieut.-Col.) George Scott Jackson, D.S.O., Northumberland Fusiliers (Territorial Force) and Royal Army Medical Corps.

Temp. Col. Francis Kelly, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Ernest Charles Lindsay, M.B., F.R.C.S., Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Henry MacCormac, M.B., M.R.C.P., Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) Arthur Maunsell MacLaughlin, Royal Army Medical Corps.

Col. Robert Lockhart Ross Macleod, C.B., Royal Army Medical Corps.

- Temp. Major (Temp. Col.) Charles Hewitt Miller, Royal Army Medical Corps.
 Col. Frederick James Morgan, C.M.G., late Royal Army Medical Corps.
 Col. Edgar Montagu Pilcher, C.B., D.S.O., late Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) Charles Edwards Pollock, D.S.O., Royal Army Medical Corps.
 Col. Harold Vernon Prynne, D.S.O., late Royal Army Medical Corps.
 Capt. (Acting Major) Charles Frederick Morris Saint, M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Lieut.-Col. (Temp. Col.) John Payzant Silver, D.S.O., Royal Army Medical Corps.
 Temp. Major Frederick Newton Gisboine Starr, Royal Army Medical Corps.
 Col. John Charles Maron Statham, C.M.G., late Royal Army Medical Corps.
 Col. Hugh Stanley Thurston, C.B., C.M.G., late Royal Army Medical Corps.
 Temp. Col. Alfred Edwards Webb-Johnson, D.S.O., M.B., Royal Army Medical Corps.
 Lieut.-Col. and Brevet Col. Frederick Hibbart Westmacott, Royal Army Medical Corps (Territorial Force).
 Lieut.-Col. (Temp. Col.) Ernest Arnold Wraith, D.S.O., Royal Army Medical Corps (Territorial Force).
 To be Officers of the Military Division of the said Most Excellent Order :—
 Temp. Capt. Francis John Allen, M.C., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) William Anderson, M.B., F.R.C.S., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) William Brodie Gurney Angus, M.C., Royal Army Medical Corps.
 Capt. (Acting Major) Samuel Richard Armstrong, Royal Army Medical Corps (Special Reserve).
 Temp. Capt. Ernest Francis Bashford, Royal Army Medical Corps.
 Capt. (Acting Major) Hubert Tunstall Bates, Royal Army Medical Corps (Territorial Force).
 Capt. (Temp. Qmr. and Major) David Charles Baxter, Royal Army Medical Corps.
 Capt. Henry Cuthbert Bazett, M.C., Royal Army Medical Corps.
 Temp. Qmr. and Capt. Sydney Thomas Beard, Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) William Bennett, D.S.O., Royal Army Medical Corps.
 Temp. Major George Augustus Benson, D.C.M., Royal Army Medical Corps (Reserve of Officers).
 Temp. Capt. Gerald Waddington Beresford, Royal Army Medical Corps.
 Capt. (Acting Major) Winslow Seymour Stirling Berry, Royal Army Medical Corps.
 Capt. and Brevet Major (Acting Lieut.-Col.) Harold Henry Blake, Royal Army Medical Corps.
 Qmr. and Capt. William Brennan, Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Lennox Ross Broster, M.B., Royal Army Medical Corps.
 Capt. (Acting Lieut.-Col.) John Bruce, Royal Army Medical Corps (Territorial Force).
 Major (Acting Lieut.-Col.) James Charles Gordon Carmichael, Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Thomas Moravian Carter, Royal Army Medical Corps (Territorial Force).
 Major Richard C. Clarke, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. Claude Gray Colyer, Royal Army Medical Corps.
 Major Daniel Maurice Corbett, M.B., Royal Army Medical Corps.
 Temp. and Hon. Major Ernest Granville Crabtree, Royal Army Medical Corps.
 Temp. Capt. John Gibson Craig, Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) John Martin Maynard Crawford, Royal Army Medical Corps.
 Major John Francis Cunningham, Royal Army Medical Corps.
 Capt. (Acting Major) John Dale, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Lieut.-Col.) Hugh Stevenson Davidson, M.B., F.R.C.S., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) George de la Cour, Royal Army Medical Corps.
 Capt. (Acting Major) Richard Frederick O'Toole Dickinson, Royal Army Medical Corps.
 Capt. (Acting Major) Robert Garsode Dixon, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. Roy Samuel Dobbins, Royal Army Medical Corps.
 Capt. (Acting Major) Arthur William Hunter Donaldson, Royal Army Medical Corps (Territorial Force).
 Major James Henry Douglas, Royal Army Medical Corps.
 Temp. Hon. Lieut.-Col. Georges Dreyer, Royal Army Medical Corps.
 Temp. Capt. James Douglas Driberg, M.C., Royal Army Medical Corps.
 Temp. Capt. Cuthbert Dukes, Esq., Royal Army Medical Corps.
 Major James Mathews Duncan, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Lieut.-Col.) William Duncan, Royal Army Medical Corps (Territorial Force).
 Qmr. and Capt. (Temp. Major) Edmund Edser, Royal Army Medical Corps.
 Major John Everidge, Royal Army Medical Corps (Territorial Force).
 Capt. Montgomery du Bois Ferguson, Royal Army Medical Corps.
 Qmr. and Capt. Charles Arthur Figg, Royal Army Medical Corps.
 Capt. Charles Forbes, M.B., Royal Army Medical Corps (Territorial Force).
 Temp. and Hon. Major Kennedy Forster, Royal Army Medical Corps.
 Major Michael George Forster, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) Thomas Lockhead Fraser, Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Howell Woodwell Gabe, Royal Army Medical Corps.

Capt. (Acting Major) Gerald Francis Petvin Gibbons, Royal Army Medical Corps (Special Reserve).

Capt. (Acting Major) Archibald John Gilchrist, M.C., Royal Army Medical Corps.

Capt. Henry James Gorrie, Royal Army Medical Corps (Territorial Force).

Temp. Capt. Charles Bernard Goulden, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) David James Graham, M.D., F.R.C.P., Royal Army Medical Corps (Territorial Force).

Major (Acting Lieut.-Col.) Arthur Claypon Horner Gray, Royal Army Medical Corps.

Qmr. and Capt. Ernest Moore Grierson, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Alexander George Hamilton, Royal Army Medical Corps (Territorial Force).

Temp. Capt. James Norman Jackson Hartley, Royal Army Medical Corps.

Major Alfred Herbert Heslop, D.S.O., Royal Army Medical Corps.

Capt. (Acting Major) Thomas Twistington Higgins, M.B., F.R.C.S., Royal Army Medical Corps.

Temp. Major Charles William Menclaus Hope, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Frederick William Johnson, Royal Army Medical Corps (Territorial Force).

Temp. Qmr. and Capt. Robert George Johnston, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Edererick Percy Joscelyne, M.C., Royal Army Medical Corps.

Capt. Colin King, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Ernest Knight, Royal Army Medical Corps (Territorial Force).

Temp. Major Louis Francis Knuthsen, Royal Army Medical Corps (Territorial Force).

Qmr. and Capt. Herbert Benjamin Lee, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Robert Walter Dickson Leslie, Royal Army Medical Corps.

Temp. Capt. Thomas Percy Lewis, Royal Army Medical Corps.

Temp. Capt. Walker Stewart Lindsay, Royal Army Medical Corps.

Temp. Capt. Norman Peace Lacey Lumb, Royal Army Medical Corps.

Temp. Capt. Francis Caven Macdonald, M.B., Royal Army Medical Corps.

Temp. Capt. William MacEwan, Royal Army Medical Corps.

Capt. (Acting Major) Ronald Bute MacFie, Royal Army Medical Corps.

Temp. Capt. (Acting Major) Colin Mackenzie, Royal Army Medical Corps.

Capt. (Acting Major) David Murdock Marr, Royal Army Medical Corps (Special Reserve).

Temp. Capt. Octavius de Burgh Marsh, Royal Army Medical Corps.

Capt. (Acting Major) Geoffrey Marshall, Royal Army Medical Corps (Special Reserve).

Major Isa Carswell Marshall, Royal Army Medical Corps (Territorial Force).

Major Charles James Martin, M.B., Royal Army Medical Corps (Territorial Force).

Major Samuel Martyn, M.B., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Robert Massie, Royal Army Medical Corps.

Temp. Capt. Octavius Studdert Maunsell, Royal Army Medical Corps.

Temp. Capt. Edward Thomas Campbell Milligan, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Hugh Glencairn Monteith, D.S.O., Royal Army Medical Corps.

Temp. Capt. Robert Foster Moore, Royal Army Medical Corps.

Capt. (Acting Major) James York Moore, Royal Army Medical Corps.

Temp. Capt. John Tertius Morrison, Royal Army Medical Corps.

Temp. Capt. (Acting Major) Francis Henry Moxon, Royal Army Medical Corps.

Temp. Capt. George London Neil, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Richard Ernest Upton Newman, M.C., Royal Army Medical Corps.

Hon. Lieut. Col. Edward Hall Nicholas, Royal Army Medical Corps.

Temp. Qmr. and Capt. Ernest O'Hara, Royal Army Medical Corps.

Temp. Major Matthew William Victor Oliver, Royal Army Medical Corps.

Capt. Thomas MacLay Ormiston, Royal Army Medical Corps (Territorial Force).

Qmr. and Major John Williams Osborne, Royal Army Medical Corps.

Temp. Capt. Alexander Croyden Palmer, Royal Army Medical Corps.

Capt. (Acting Major) Matthew Wallace Paterson, M.C., Royal Army Medical Corps (Special Reserve).

Capt. Henry Marrian Joseph Perry, Royal Army Medical Corps.

Capt. (Acting Major) William de Malet Peyton, M.B., Royal Army Medical Corps.

Capt. (Acting Major) William Robertus Pierce, Royal Army Medical Corps (Territorial Force).

Temp. Capt. Albert Edward Pinniger, Royal Army Medical Corps.

Temp. Capt. William Arthur Rees, Royal Army Medical Corps.

Qmr. and Capt. (Acting Major) William Clifford Renton, Royal Army Medical Corps.

Major John Duncan Richmond, D.S.O., Royal Army Medical Corps.

Major Michael Balfour Hutchinson Ritchie, D.S.O., Royal Army Medical Corps.

Capt. (Acting Major) Robert Linton Ritchie, Royal Army Medical Corps.

Temp. Capt. (Acting Major) James Ernest Helme Roberts, Royal Army Medical Corps.

Capt. Acting Major Alfred Leopold Robertson, Royal Army Medical Corps.

Temp. Capt. Robert Charles Robertson, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Henry Buckley Roderick, Royal Army Medical Corps (Territorial Force).

- Capt. (Acting Major) Harry Duggan Rollinson, Royal Army Medical Corps (Special Reserve).
 Capt. Walter Joseph Ronan, M.B., Royal Army Medical Corps.
 Qmr. and Capt. Charles Thomes Ross, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) William Henry Rowell, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Lieut.-Col.) Percival Thomas Rutherford, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Herbert Henry Sampson, M.C., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Harold Willis Scawin, Royal Army Medical Corps.
 Capt. (Acting Lieut.-Col.) David Jobson Scott, M.C., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Edward James Selby, Royal Army Medical Corps.
 Temp. Capt. Herbert Park Shackleton, Royal Army Medical Corps.
 Lieut.-Col. George Charles Edward Simpson, Royal Army Medical Corps (Territorial Force).
 Lieut.-Col. (Acting Col.) Harold Simson, Royal Army Medical Corps.
 Capt. (Acting Major) George William Smith, Royal Army Medical Corps.
 Lieut.-Col. Samuel Boylan Smith, D.S.O., Royal Army Medical Corps.
 Capt. Reginald Samuel Sherrard Statham, Royal Army Medical Corps.
 Lieut.-Col. Guy Neville Stephen, Royal Army Medical Corps.
 Capt. (Acting Major) George Henderson Stevenson, M.C., Royal Army Medical Corps (Special Reserve).
 Capt. Ralph William Ewart Stickings, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. William Stirling, Royal Army Medical Corps.
 Capt. (Acting Major) William Stobie, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. Adrian Stokes, D.S.O., Royal Army Medical Corps.
 Temp. Capt. (Acting Lieut.-Col.) Henry Stokes, Royal Army Medical Corps.
 Temp. Capt. Edward Joseph Stuckey, Royal Army Medical Corps.
 Capt. (Acting Major) Richard Woodward Swayne, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Douglas Compton Taylor, Royal Army Medical Corps.
 Qmr. and Capt. Douglas Percy Taylor, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Eric Stewart Taylor, Royal Army Medical Corps (Territorial Force).
 Temp. Major Gordon Taylor, Royal Army Medical Corps.
 Temp. Capt. Arthur Theodore Todd, M.B., Royal Army Medical Corps.
 Capt. (Acting Major) Leonard Robert Tosswill, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Philip Northcote Vellacott, Royal Army Medical Corps.
 Temp. Capt. Charles Wilmot Wanklyn-James, Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Walter James Waters, Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Frank William Wesley, Royal Army Medical Corps.
 Major Charles Francis White, Royal Army Medical Corps.
 Temp. Capt. Maurice Henry Whiting, Royal Army Medical Corps.
 Qmr. and Capt. John Wickersham, Royal Army Medical Corps.
 Capt. (Acting Major) Kenneth Douglas Wilkinson, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) Archibald Wilson, M.C., M.B., Royal Army Medical Corps (Special Reserve).
 Temp. Capt. John Alexander Wilson, Royal Army Medical Corps.
 Temp. Capt. Francis Arthur Winder, Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Frederick Butwell Winfield, Royal Army Medical Corps.
 Capt. (Acting Major) John Lawrence Wood, Royal Army Medical Corps.
 Temp. Capt. Henry Yellowless, Royal Army Medical Corps.
 To be Members of the Military Division of the said Most Excellent Order :—
 Temp. Qmr. and Lieut. Ernest Gottlieb Isdeal Brice, Royal Army Medical Corps.
 461440 Qmr.-Serjt. (Acting Serjt.-Major) Ernest Herbert Clarke, Royal Army Medical Corps (Territorial Force).
 18718 Qmr.-Serjt. William Henry Parr, Royal Army Medical Corps.
 508250 Qmr.-Serjt. William John Perch, Royal Army Medical Corps (Territorial Force).
 11405 Qmr.-Serjt. William Scott, Royal Army Medical Corps.
 58669 Qmr.-Serjt. Ernest Alfred Smith, Royal Army Medical Corps.
 103 Qmr.-Serjt. George Patrick Steer, Royal Army Medical Corps.
 Qmr. and Lieut. Ernest Henry Tibbs, Royal Army Medical Corps (Territorial Force).

CANADIAN OVERSEAS FORCES.

To be Commanders of the Military Division of the said Most Excellent Order :—

- Lieut.-Col. Edward Vincent Hogan, Canadian Army Medical Corps.
 Lieut.-Col. (Acting Col.) Charles Perry Templeton, D.S.O., Canadian Army Medical Corps.
 Lieut.-Col. Francis Walter Ernest Wilson, Canadian Army Medical Corps.
 To be Officers of the Military Division of the said Most Excellent Order :—
 Lieut.-Col. Allan Edward Kingston Bennett, Canadian Army Medical Corps.

Major Arthur William Mickle Ellis, Canadian Army Medical Corps.
 Major Arthur Llewelyn Jones, M.C., Canadian Army Medical Corps.
 Major Lorne Fauntleroy Jones, Canadian Army Medical Corps.
 Major Archibald Francis Macaulay, Canadian Army Medical Corps.
 Qmr. and Hon. Captain Harry A. Marshall, Canadian Army Medical Corps.
 Capt. James Frederick Stewart Marshall, M.C., Canadian Army Medical Corps.
 Capt. Herbert Walter Martin, Canadian Army Medical Corps.
 Lieut.-Col. Clifford Hamilton Reason, D.S.O., Canadian Army Medical Corps.
 Capt. William Augustus Richardson, Canadian Army Medical Corps.
 Major Russell Butler Robertson, Canadian Army Medical Corps.
 Major Peter Donald Stewart, Canadian Army Medical Corps.
 Major Samuel James Streight, Canadian Army Medical Corps.
 Qmr. and Hon. Capt. John Stanley Ward, Canadian Army Medical Corps.
 Lieut.-Col. Fred Armstrong Young, Canadian Army Medical Corps.
 To be Members of the Military Division of the said Most Excellent Order :—
 535407 Serjt.-Major Frederick Worrall Thom, Canadian Army Medical Corps.

AUSTRALIAN IMPERIAL FORCES.

To be Officers of the Military Division of the said Most Excellent Order :—
 Capt. George Bell, Australian Army Medical Corps.
 Capt. (Temp. Major) John William Farrar, Australian Army Medical Corps.
 Lieut.-Col. Piers Fiaschi, Australian Army Medical Corps.
 Major Frederick Donald Herbert Blois Lawten, Australian Army Medical Corps.
 Lieut.-Col. Valentine Osborne Stacey, Australian Army Medical Corps.

SOUTH AFRICAN FORCES.

To be Officer of the Military Division of the said Most Excellent Order :—
 Lieut.-Col. George Henry Usmar, South African Medical Corps.
 To be a Member of the Military Division of the said Most Excellent Order :—
 17409 Serjt.-Major Henry Kimberley, South African Medical Corps.

War Office,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to approve of the undermentioned rewards for distinguished service in connexion with military operations in France and Flanders, dated June 3, 1919 :—

To be Brevet Lieutenant-Colonel :—

(On Retired List, Reserve of Officers, Special Reserve, New Army, or Territorial Force, in the case of Officers belonging to these categories, as applicable.)

Major (Acting Lieut.-Col.) R. B. Ainsworth, D.S.O., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) T. S. Coates, O.B.E., Royal Army Medical Corps.
 Major (Temp. Lieut.-Col.) F. D. G. Howell, D.S.O., M.C., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) W. F. Tyndale, C.M.G., D.S.O., M.D., Royal Army Medical Corps.

To be Brevet Major :—

(On Retired List, Reserve of Officers, Special Reserve, New Army, or Territorial Force, in the case of Officers belonging to these categories as applicable.)

Capt. (Acting Lieut.-Col.) J. D. Bowie, D.S.O., M.B., Royal Army Medical Corps.
 Capt. (Acting Major) R. Gale, D.S.O., M.B., Royal Army Medical Corps.
 Temp. Capt. R. McC. Hill, D.S.O., M.B., Royal Army Medical Corps.
 To be granted the next higher rate of pay under the provisions of the Royal Warrant :—
 Qmr. and Capt. W. J. Rice, Royal Army Medical Corps (Territorial Force).

AWARDED THE DISTINGUISHED SERVICE ORDER.

Capt. (Acting Lieut.-Col.) Henry Neville Burroughes, M.B., 2/2nd (S. Mid.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. Guy de Hoghton Dawson, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Charles Milligan Drew, M.B., 134th Field Ambulance, Royal Army Medical Corps.

Lieut.-Col. Arthur David Ducat, M.B., 2/3rd (London) Field Ambulance, Royal Army Medical Corps.

Major Arthur Henry Falkner, Royal Army Medical Corps (Territorial Force), attached 8th Battalion Liverpool Regiment.

Capt. (Acting Lieut.-Col.) John Henry Pearson Fraser, M.C., R.A.M.C. (Territorial Force), attached 53rd Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Rudolf William Galloway, M.B., 2nd Cavalry Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Ivor Robert Hudleston, 136th Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) John Miller, M.C., 1/2nd (N.M.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Major (Acting Lieut.-Col.) Donald de Courcey O'Grady, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Edward Phillips, M.C., M.B., 106th Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) John William Cotter Stubbs, M.C., M.B., 16th Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Leslie Ferguson Kennedy Way, 101st Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) G. K. Maurice, Royal Army Medical Corps (Territorial Force), attached 8th Field Ambulance.

Capt. (Acting Lieut.-Col.) Arthur Cecil Hays McCullagh, M.B., 2/2nd (North'brn) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Canadian Force.

Major (Acting Lieut.-Col.) Richard Henry Moore Hardisty, M.C., 6th Field Ambulance, Canadian Army Medical Corps.

Lieut.-Col. Ronald Hugh Macdonald, M.C., 4th Field Ambulance, Canadian Army Medical Corps.

Major (Acting Lieut.-Col.) Ernest Raymond Selby, 8th Field Ambulance, Canadian Army Medical Corps.

Australian Imperial Force.

Lieut.-Col. Hugh Bennett Lewers, O.B.E., 11th Field Ambulance, Australian Army Medical Corps.

Major (Temp. Lieut.-Col.) John Robb Muirhead, 5th Field Ambulance, Australian Army Medical Corps.

Major Marcus Vicars Southey, 1st Field Ambulance, Australian Army Medical Corps.

Lieut.-Col. Clive Wentworth Thompson, 14th Field Ambulance, Australian Army Medical Corps.

Lieut.-Col. Frank Couper Wooster, 13th Field Ambulance, Australian Army Medical Corps.

New Zealand Force.

Major (Temp. Lieut.-Col.) Philip John Jory, M.B., 2nd Field Ambulance, New Zealand Army Medical Corps.

AWARDED A SECOND BAR TO THE MILITARY CROSS.

Capt. (Acting Major) Henry Joseph Milligan, M.C., M.D., Royal Army Medical Corps (Territorial Force). (M.C. gazetted June 4, 1917.)

AWARDED THE MILITARY CROSS.

Temp. Capt. Robert Burnside Carter, M.B., Royal Army Medical Corps.

Capt. William King Churchhouse, Royal Army Medical Corps (Territorial Force), attached 2,20th Battalion London Regiment.

Temp. Capt. Howard Ebenezer Collier, M.B., Royal Army Medical Corps, attached 1st Battalion Gloucester Regiment.

Temp. Capt. (Acting Major) Walter Crabtree, M.B., 93rd Field Ambulance, Royal Army Medical Corps.

Rev. Eugene Daly, Temp. Chaplain to the Forces, 4th Class, R.A.C.D., attached 102nd Field Ambulance, Royal Army Medical Corps.

Temp. Capt. Max Everard Delafield, M.B., Royal Army Medical Corps, attached 1/3rd (E. Lincs.) Field Ambulance.

Temp. Capt. (Acting Major) Joseph Stanislaus Doyle, M.B., 104th Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Major) Alexander Erskine Drynan, M.B., 56th Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Major) Alfred Joseph Dunlop, M.B., 43rd Field Ambulance, Royal Army Medical Corps.

Temp. Capt. George Ernest Elkington, M.B., 103rd Field Ambulance, Royal Army Medical Corps.

Temp. Capt. Gilbert John Farie, M.B., 141st Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Major) William Pike Ferguson, M.D., 2/3rd East Lincs. Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. John Brady Galligan, M.B., Royal Army Medical Corps, attached 62nd Brigade, Royal Garrison Artillery.

Capt. David Gardiner, M.B., Royal Army Medical Corps, attached 9th Battalion Devon Regiment.

Capt. (Acting Major) Alexander Muir Gibson, M.B., 1/2nd East Lincs. Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. Joseph Graham, M.B., 38th Field Ambulance, Royal Army Medical Corps.

Capt. Arthur Geoffrey Pallison Hardwick, 59th Field Ambulance, Royal Army Medical Corps.

Temp. Capt. James Leith Hendry, Royal Army Medical Corps, attached 55th Army Brigade, Royal Garrison Artillery.

Capt. (Acting Major) Alfred Morgan Hughes, 4th London Field Ambulance, Royal Army Medical Corps.

Lieut. Arthur Kennedy, M.B., Royal Army Medical Corps (Special Reserve), attached 2/3rd H.C. Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. Havelock Thomas Lippiatt, Royal Army Medical Corps, attached 93rd Brigade, Royal Garrison Artillery.

Temp. Capt. John Bertram McCabe, Royal Army Medical Corps.

Temp. Capt. Roderic MacGill, Royal Army Medical Corps, attached 6th Tank Battalion.

Capt. (Acting Major) Thomas Barrington McKee, M.B., 2/2nd H.C. Field Ambulance, Royal Army Medical Corps.

Temp. Capt. John McMillan, M.B., Royal Army Medical Corps, attached 1st Battalion Tank Corps.

Temp. Capt. Duncan Malloch, M.B., Royal Army Medical Corps, attached Headquarters, 150th Army Brigade, Royal Field Artillery.

Temp. Capt. (Acting Major) Allan Massey, M.B., 111th Field Ambulance, Royal Army Medical Corps.

Temp. Qmr. and Capt. Henry George Miller, 9th Field Ambulance, Royal Army Medical Corps.

Capt. O'Connell O'Sullivan, M.B., Royal Army Medical Corps (Territorial Force), attached 14th Battalion, Royal Warwickshire Regiment.

Temp. Capt. William Lyle Paterson, Royal Army Medical Corps, attached Headquarters, 17th Brigade, Royal Garrison Artillery.

Temp. Capt. William Maxwell Penny, M.D., Royal Army Medical Corps, attached 64th (East Lancs.) Field Ambulance (Territorial Force).

Capt. Henry James Rice, M.B., Royal Army Medical Corps (Special Reserve), attached 10th Battalion, Liverpool Regiment.

Temp. Capt. James Dewar Robertson, M.B., Royal Army Medical Corps, attached 19th Battalion Machine Gun Corps.

Capt. (Acting Major) John Forbes William Sanderson, M.B., Royal Army Medical Corps (Special Reserve).

Capt. (Acting Major) Sidney Scott, M.B., Royal Army Medical Corps, attached 48th Field Ambulance, Territorial Force.

Temp. Capt. (Acting Major) Arthur Herbert Spicer, M.B., Royal Army Medical Corps.

Temp. Capt. Robert Howie Thomson, Royal Army Medical Corps, attached 7th Cavalry Field Ambulance.

Temp. Capt. Eric Morse Townsend, Royal Army Medical Corps.

Temp. Capt. (Acting Major) Henry William Turner, 104th Field Ambulance, Royal Army Medical Corps.

Temp. Capt. (Acting Major) Alfred Stewart Wakeley, 1st Field Ambulance, Royal Army Medical Corps.

Capt. George Scott Williamson, 2/1st S. Mid. Field Ambulance, Royal Army Medical Corps (Territorial Force).

CANADIAN FORCE.

Capt. Thomas Douglas Bennett, 13th Canadian Field Ambulance, Canadian Army Medical Corps.

Capt. Hector Clayton Hall, Canadian Army Medical Corps, attached Headquarters, 2nd Canadian Division.

Capt. Ambert Hastie Veitch, 3rd Canadian Field Ambulance, Canadian Army Medical Corps.

AUSTRALIAN IMPERIAL FORCE.

Capt. David Henry Bootle, 1st Battalion Australian Field Ambulance, Australian Army Medical Corps.

Capt. Archie Sheridan Cockburn, Australian Army Medical Corps, attached 6th Battalion Australian Infantry.

His Majesty the King has been graciously pleased to approve of the undermentioned rewards for distinguished service in connexion with military operations with the Army in France and Flanders :—

AWARDED THE DISTINGUISHED CONDUCT MEDAL.

19595 Staff-Serjt. (Temp. Serjt.-Major) C. E. Bull, Royal Army Medical Corps (Camberley).

36924 Pte. J. Carless, 49th Field Ambulance, Royal Army Medical Corps (West Bromwich).

497296 Serjt. P. O. Davis, 2/3rd (H.C.) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Aldstone, Surrey).

63278 Pte. T. Hadfield, 51st Field Ambulance, Royal Army Medical Corps (Barrow-in-Furness).

1611 Serjt. P. Hodson, 113th Field Ambulance, Royal Army Medical Corps (Wolverhampton).

350002 Qmr.-Serjt. (Temp. Serjt.-Major) W. Jarman, 1/1st (E. Lancs.) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Hulme).

73144 Pte. C. Knight, 7th Field Ambulance, Royal Army Medical Corps (Wigston Magna).

58238 Cpl. (Acting Serjt.) F. Mellor, 142nd Field Ambulance, Royal Army Medical Corps (Wetherby).
 301150 Cpl. (Acting-Serjt.) H. Monogan, 2/3rd (West Riding) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Crosshill).
 18453 Temp. Serjt.-Major F. A. Philbrook, 1st Field Ambulance, Royal Army Medical Corps (Colchester).
 48456 Cpl. E. Schoon, 131st Field Ambulance, Royal Army Medical Corps (Hull).
 305009 Cpl. (Acting Staff-Serjt.) G. Simpson, 1/3rd (High.) Field Ambulance, Royal Army Medical Corps (T.F.) Dundee.
 48812 Cpl. W. H. Thomas, 129th Field Ambulance, Royal Army Medical Corps (Ferndale).
 61586 Pte. J. Toner, 91st Field Ambulance, Royal Army Medical Corps (Dundrum).
 83138 Pte. T. Yule, 6th Field Ambulance, Royal Army Medical Corps (Hawick).

War Office,
June 3, 1919.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-commissioned Officers and Men, in recognition of valuable service rendered with the Armies in France and Flanders:—

ROYAL ARMY MEDICAL CORPS.

12377 Temp. Serjt.-Major B. L. Aldhous, D.C.M. (Mile End).
 463001 Temp. Serjt.-Major J. J. Baker (Exeter).
 12989 Temp. Serjt.-Major E. G. W. Barnes (Barnes).
 15544 Temp. Serjt.-Major E. J. Barnes (Glasgow).
 40928 Serjt.-Major E. Briggs (Belfast).
 356001 Temp. Serjt.-Major T. E. Carter (Manchester).
 46419 Serjt.-Major H. Charlesworth (Wandsworth).
 12410 Serjt.-Major R. B. Crombes (Portsea).
 30403 Serjt.-Major A. Crossley (Kendal).
 407011 Temp. Serjt.-Major B. E. Crossley (Leeds).
 17358 Temp. Serjt.-Major C. Ennor (Camberwell).
 337283 Temp. Serjt.-Major F. Fowles, 2/1st Field Ambulance (Winsford).
 11223 Serjt.-Major J. F. Hampton (Calstock).
 51020 Temp. Serjt.-Major F. Hopkins, 2nd Field Ambulance (Merthyr Tydvil).
 492001 Temp. Serjt.-Major W. H. Ingamells, 1st Field Ambulance (Margate).
 322107 Temp. Serjt.-Major D. M. Kerr (Glasgow).
 16440 Temp. Serjt.-Major R. Kildea (Belfast).
 58003 Serjt.-Major A. E. Hitchen, M.M. (Cleethorpes).
 39116 Temp. Serjt.-Major E. Mitchell (Whitby).
 11613 Serjt.-Major C. R. Morrie, M.M. (E.) (Shorncliffe).
 392007 Temp. Serjt.-Major W. Potts (Hexham).
 15619 Serjt.-Major E. Preston (East Ham).
 93302 Temp. Serjt.-Major J. Purves (Glasgow).
 457371 Temp. Serjt.-Major A. D. Savage, 2/1st Field Ambulance (Teignmouth).
 25588 Serjt.-Major W. R. Steadman (Bristol).
 12185 Temp. Regtl. Serjt.-Major A. S. Willis, M.M. (Westbourne Park).
 12056 Serjt.-Major E. Winton (Southampton).
 11315 Qmr.-Serjt. G. A. Austin (Aberdeen).
 527418 Qmr.-Serjt. A. E. Beaumont (Manchester).
 15027 Qmr.-Serjt. (Acting Serjt.-Major) W. Bush (Dublin).
 59026 Qmr.-Serjt. C. G. Cooper (Wells).
 41161 Qmr.-Serjt. W. J. Dennison (Belfast).
 35220 Qmr.-Serjt. H. C. Dixon (Wood Green).
 79559 Qmr.-Serjt. W. J. Ellis (Brixton).
 417039 Qmr.-Serjt. B. A. Green, 1st Field Ambulance (Derby).
 36455 Qmr.-Serjt. W. A. Griffiths (Birmingham).
 343086 Qmr.-Serjt. L. Heap (Kendal).
 88151 Qmr.-Serjt. W. J. Hodgkinson (Glasgow).
 17632 Qmr. Serjt. (Acting Serjt.-Major) H. C. A. Lunn (Bournemouth).
 66197 Qmr.-Serjt. F. H. L. Poat (Saltash).
 74683 Qmr.-Serjt. H. W. Prince (Birmingham).
 19135 Qmr.-Serjt. W. H. Quelch (Pimlico).
 41872 Qmr.-Serjt. E. H. B. Rawlins (Birmingham).
 350471 Qmr.-Serjt. M. Summerville, 2/1st Field Ambulance (Manchester).
 41996 Qmr.-Serjt. F. W. Tomkinson (Walsall).
 39488 Qmr.-Serjt. S. Unsworth (Manchester).
 52160 Qmr.-Serjt. A. S. Ward (Earlsfield).
 54417 Qmr.-Serjt. J. White (Ilverston).
 386030 Qmr.-Serjt. G. W. Wright, 1st Field Ambulance (Newcastle).

316067 Staff-Serjt. J. Anderson, 1st Field Ambulance (Glasgow).
 19827 Staff-Serjt. (Acting Qmr.-Serjt.) J. W. Baxter (Streatham).
 18380 Staff-Serjt. E. Bodger (Taunton).
 421159 Staff-Serjt. W. H. M. Bore, 1/3rd Field Ambulance (Wolverhampton).
 403167 Staff-Serjt. E. H. Collinson, 1/2nd Field Ambulance (Leeds).
 17870 Staff-Serjt. (Acting Serjt.-Major) E. Cragg (Notts.).
 37317 Staff-Serjt. A. Currell (East Ham).
 19007 Staff-Serjt. (Acting Serjt.-Major) J. R. Dare (Vauxhall).
 40540 Staff-Serjt. W. C. Dickson (Edinburgh).
 41162 Staff-Serjt. (Acting Serjt.-Major) A. Donnelly, M.M. (Belfast).
 41162 Staff-Serjt. R. B. Ballet (Chester).
 33059 Staff-Serjt. D. Grandy (Warrington).
 545849 Staff-Serjt. (Acting Serjt.-Major) H. J. H. Giles (Woburn Sands).
 38145 Staff-Serjt. E. Goddard (Leytonstone).
 341287 Staff-Serjt. (Acting Qmr.-Serjt.) G. Goodall, 65th Field Ambulance (St. Helens).
 53534 Staff-Serjt. J. Graham (Bloomfield-by-Annam).
 2046 Staff-Serjt. (Acting Qmr.-Serjt.) F. J. Hammond (Warwick).
 493003 Staff Serjt. (Acting Serjt.-Major) J. A. Hart, 2nd Field Ambulance (Maidstone).
 40037 Staff-Serjt. P. Heyes (Newcastle).
 17728 Staff-Serjt. (Acting Serjt.-Major) T. Hynes (Chester).
 1302 Staff-Serjt. (Temp. Qmr.-Serjt.) J. Jack (Pimlico).
 527032 Staff-Serjt. A. Jenkins (Marylebone).
 37480 Staff-Serjt. B. J. Jones (Catford).
 19272 Staff-Serjt. W. J. Lee (Glassel, N.B.).
 50192 Staff-Serjt. N. Linnet (Coventry).
 61214 Staff-Serjt. (Acting Serjt.-Major) W. J. McNamara (Leicester).
 16982 Staff-Serjt. (Acting Serjt.-Major) J. Medland (Jersey).
 53553 Staff-Serjt. A. S. Mustart (Liverpool).
 26798 Staff-Serjt. (Acting Qmr.-Serjt.) W. C. Parker (Woolston).
 19161 Staff-Serjt. G. Parkinson (Draperstown).
 439206 Staff-Serjt. (Acting Serjt.-Major) A. H. Pelley, 2/3rd Field Ambulance (Bristol).
 47238 Staff-Serjt. C. Perks (Wolverhampton).
 95468 Staff-Serjt. A. Preston (Spalding).
 341347 Staff-Serjt. L. Prestt, 64th Field Ambulance (St. Helens).
 18559 Staff-Serjt. G. F. Rodgers (E.) (Chichester).
 30737 Staff-Serjt. (Acting Serjt.-Major) G. H. Saunders (Wolvercote).
 309056 Staff-Serjt. A. L. Smith, 1/2nd Field Ambulance (Inverurie).
 22199 Staff-Serjt. H. Taylor (Clitheroe).
 64089 Staff-Serjt. J. Thomson (Edinburgh).
 545250 Staff-Serjt. (Acting Qmr.-Serjt.) E. A. Wadmore (Bridgwater).
 69597 Staff-Serjt. W. P. Wood (Lichfield).
 343006 Serjt. F. Atkins (Kendall).
 510481 Serjt. W. de G. Baker, 2nd Field Ambulance (Maidstone).
 15835 Serjt. (Acting Qmr.-Serjt.) W. Beavis (Norwich).
 352274 Serjt. (Acting Staff-Serjt.) D. Berry, 2nd Field Ambulance (Burnley).
 435298 Serjt. R. J. G. Bickell, 2/1st Field Ambulance (Birmingham).
 527080 Serjt. W. Billings (Upper Clapton).
 545181 Serjt. T. Blakeley (Carlisle).
 33522 Serjt. (Acting Staff-Serjt.) W. A. Blezard (Umtali, Rhodesia).
 17519 Serjt. (Temp. Staff-Serjt.) A. Boxall (Coventry).
 534356 Serjt. J. A. Bradshaw (Liverpool).
 19597 Serjt. (Temp. Qmr.-Serjt.) L. Brindle (Marlborough).
 69120 Serjt. A. O. A. Broocke (Bournemouth).
 81627 Serjt. J. Bruce (Edinburgh).
 12384 Serjt. T. W. Burnhill (Portsmouth).
 43356 Serjt. H. B. Chatburn (Grimsby).
 72639 Serjt. H. A. Christian (Great Yarmouth).
 441085 Serjt. A. E. Church (Birmingham).
 58245 Serjt. J. J. Clarke (Northallerton).
 19851 Serjt. (Acting Staff-Serjt.) P. E. Claydon (Kilburn).
 39999 Serjt. C. E. Collinge (Redcliffe).
 538218 Serjt. F. J. Corby, 6th Field Ambulance (Hounslow).
 16303 Serjt. (Acting Qmr.-Serjt.) H. Cunningham (Bedford Park).
 32070 Serjt. (Acting Staff-Serjt.) A. C. Dow (Lee).
 437414 Serjt. W. J. Edgington, 2nd Field Ambulance (Southampton).
 300069 Serjt. D. Fraser, 1st Field Ambulance (Inverness).
 512299 Serjt. H. L. Furlong, 2/3rd Field Ambulance (Barnet).
 388808 Serjt. J. T. Goodwin, 2nd Field Ambulance (Kendall).
 73999 Serjt. F. P. Harrison (Walsall).

40584 Serjt. J. Harrison (Birmingham).
 508191 Serjt. H. E. Hewitt, 2/1st Field Ambulance (Croydon).
 66154 Serjt. A. B. Hibberd (Kidderminster).
 51466 Serjt. J. Hodgkinson (Liverpool).
 337287 Serjt. W. E. Hooson, 87th Field Ambulance (Llandudno).
 31811 Serjt. O. Hopkins (Camberwell).
 67398 Serjt. J. Jauncey (Manchester).
 41034 Serjt. G. Kerr (E.) (Belfast).
 421343 Serjt. P. F. Lloyd, 2 3rd Field Ambulance (Wolverhampton).
 31084 Serjt. C. Lusty (Swindon).
 5328 Serjt. (Acting Staff-Serjt.) F. Maydon (Finsbury Park).
 19283 Serjt. E. Neagherm (Liverpool).
 341331 Serjt. W. H. Mills, 1/3rd Field Ambulance (St. Helens).
 71496 Serjt. J. Monour (Sunderland).
 527093 Serjt. W. E. Ostler (St. John's Hill).
 66744 Serjt. H. J. Parker (Kidderminster).
 540002 Serjt. A. C. Fearcem (Beckenham).
 65873 Serjt. G. Pellett (Sidley).
 18411 Serjt. G. H. Richards, 52nd Field Ambulance (Devonport).
 37246 Serjt. N. Riddle, 54th Field Ambulance (East Middlesbrough).
 419478 Serjt. D. R. Riley, 2nd Field Ambulance (Leicester).
 18799 Serjt. (Tempy. Staff Serjt.) M. M. V. Smith (Borough).
 40858 Serjt. H. J. Standerwick (Ilminster).
 4405 Serjt. E. F. Taylor (Aldershot).
 189 Serjt. G. A. Taylor (Portsmouth).
 303089 Serjt. J. Taylor 1/2nd Field Ambulance (Inverurie).
 79059 Serjt. H. W. Townley (Wigan).
 57020 Serjt. J. A. V. Wakefield, 13th Casualty Clearing Station (Kensington).
 26007 Serjt. J. W. Walker (Dublin).
 42637 Serjt. A. Wedgbury (Redditch).
 296 Serjt. F. G. Wilson (Norwich).
 473185 Serjt. E. I. Wright, 88th Field Ambulance (Ipswich).
 19730 Serjt. (Acting Qmr. Serjt.) W. T. Young (Kingston-on-Thames).
 45811 Cpl. R. Ashley (Barnoldswick).
 423021 Cpl. (Acting Serjt.) J. Atkin (Derby).
 24215 Cpl. (Acting Serjt.) A. Auty (Manchester).
 350124 Cpl. J. Bankroft 1st Field Ambulance (Manchester).
 18003 Cpl. (Tempy. Staff Serjt.) F. Batcock (Dorking).
 356069 Cpl. (Acting Lance-Serjt.) F. Bond (Manchester).
 419386 Cpl. W. A. Booton, 2nd Field Ambulance (Leicester).
 493723 Cpl. W. F. Chick, 3rd Field Ambulance (Sevenoaks).
 13654 Cpl. (Temporary Serjt.) F. Clapton (Westbourne Park).
 343077 Cpl. Cottam, J. F. (Kendal).
 441128 Cpl. (Acting Serjt.) C. Cox (Birmingham).
 19271 Cpl. (Acting Serjt.) A. W. Dale (Maidstone).
 67246 Cpl. (Acting Serjt.) H. Ellison (Manchester).
 749 Cpl. (Acting Qmr. Serjt.) J. Evans (Bexhill).
 70607 Cpl. J. H. Graham (Gateshead).
 439241 Cpl. (Acting Serjt.) D. M. Green 2/3rd Field Ambulance (Bristol).
 66982 Cpl. (Acting Serjt.) H. Holden (East Exeter).
 337327 Cpl. (Acting Qmr.-Serjt.) W. T. Jones (Liverpool).
 527620 Cpl. (Acting Serjt.) S. Keene (Upper Tooting).
 55381 Cpl. J. Kenetick (Bradford).
 38078 Cpl. A. Kirham, (King's Cross).
 599 Cpl. (Acting Serjt.) F. G. Knight (Camberwell).
 72337 Cpl. A. H. Leasby (Kettering).
 24610 Cpl. R. Marshall (Ashington).
 4948 Cpl. (Acting Serjt.) F. H. Marshall (East Ham).
 457286 Cpl. (Acting Serjt.) H. H. Mitchell, 24th Field Ambulance (Exeter).
 307067 Cpl. (Acting Serjt.) J. Milne (Aberdeen).
 417083 Cpl. A. Moran 1st Field Ambulance (Derby).
 320177 Cpl. G. B. McMurtie, 1/3rd Field Ambulance (Edinburgh).
 43698 Cpl. J. Pearce (Walworth).
 540091 Cpl. F. C. Penny (Woolwich).
 337222 Cpl. (Acting Serjt.) C. C. Reynolds 87th Field Ambulance (Liverpool).
 58161 Cpl. T. Scanlan (Bolton).
 5998 Cpl. (Acting Serjt.) T. W. Smith (Birmingham).
 78433 Cpl. (Acting Serjt.) H. E. Strachan (Peckham).
 527709 Cpl. (Acting Serjt.) C. C. Summers (Catford).

493021 Cpl. J. E. Tavor (Kingston-on-Thames).
 58655 Cpl. (Acting Serjt.) F. Turner (Whitby).
 51751 Cpl. (Acting Serjt.) J. R. Walker (Mount Britton).
 8935 Cpl. D. R. Webb (Newport).
 81307 Pte. G. W. Allan (South Shields).
 66407 Pte. E. Ashton (Cardiff).
 68320 Pte. (Acting Lance-Serjt.) A. E. Baker (Westmoors).
 54521 Pte. (Acting Serjt.) B. G. Baker (Battersea).
 546266 Pte. (Acting Serjt.) G. Bottomley (Leigh-on-Sea).
 545924 Pte. (Acting Cpl.) C. R. Brown.
 74016 Pte. (Lance-Cpl.) G. H. W. Browning (Bristol).
 407072 Pte. (Acting Lance-Serjt.) D. D. Buchanan (Leeds).
 473439 Pte. W. D. Catchpole, 88th Field Ambulance (Ipswich).
 674 Pte. (Acting Cpl.) P. W. Clarke (West Kensington).
 74618 Pte. (Acting Serjt.) J. F. Cox (Windsor).
 315079 Pte. (Lance-Cpl.) A. Craig 2/3rd Field Ambulance (Glasgow).
 546181 Pte. (Acting Cpl.) J. E. Cropper (Rochdale).
 343011 Pte. (Lance-Cpl.) J. H. Cummings (Kendal).
 401371 Pte. (Acting-Cpl.) J. Dalby (Huddersfield).
 11736 Pte. (Temp. Serjt.) H. Davidson, (Plaistow).
 527544 Pte. (Acting Serjt.) C. Day (Ashwell).
 307064 Pte. W. F. Deans (Aberdeen).
 54320 Pte. H. Dixon (Tipperary).
 301171 Pte. (Lance-Cpl.) C. J. C. Dorian (Aberdeen).
 545715 Pte. (Acting Cpl.) T. H. Downing (Bow).
 90487 Pte. (Acting Cpl.) S. A. Dyer (Swindon).
 68407 Pte. (Acting Serjt.) A. H. Foard (Worthing).
 18770 Pte. (Temp. Cpl.) J. A. Fosh (Bow).
 441028 Pte. H. Garlick (Tipton).
 73606 Pte. (Acting Cpl.) T. M. Grant (North Shields).
 545943 Pte. (Acting Cpl.) T. F. Gutteridge (Parson's Green).
 51283 Pte. (Lance-Cpl.) G. R. Harkess (Castle Eden).
 38150 Pte. (Lance-Cpl.) T. Harrington (Kentish Town).
 493727 Pte. T. C. Head, 2/1st Field Ambulance (Maidstone).
 497489 Pte. (Acting Cpl.) S. Hellen, 3rd Field Ambulance (Bethnal Green).
 64458 Pte. (Lance-Cpl.) J. Hills (Edinburgh).
 337264 Pte. H. Howard, 87th Field Ambulance (Liverpool).
 5363 Pte. A. Hunter (Glasgow).
 421361 Pte. (Acting Serjt.) G. H. Keeling, 2/3rd Field Ambulance (Dudley).
 26004 Pte. (Acting Lance-Serjt.) H. E. Kincaid (Dublin).
 7319 Pte. (Temp. Serjt.) L. Marcus (E. Liverpool).
 392084 Pte. (Lance-Cpl.) E. Martinson (Gateshead).
 117713 Pte. (Acting Serjt.) A. E. Meadows (Gloucester).
 8955 Pte. (Acting Serjt.) C. A. Mickie (Aberdeen).
 4530 Pte. (Acting Cpl.) D. Middleton (Middlesbrough).
 38895 Pte. (Acting Cpl.) T. Morgan (Birkenhead).
 439072 Pte. (Acting Serjt.) H. G. Packer, 3rd Field Ambulance (Bristol).
 37166 Pte. (Acting Cpl.) J. L. Parry (Sydenham).
 528149 Pte. (Acting Serjt.) E. Pinner (Bradford).
 34139 Pte. L. Priestly (Bradford).
 71820 Pte. (Acting Cpl.) F. Prior, 136th Field Ambulance (E. Chester).
 545710 Pte. J. H. Richardson (Leeds).
 16763 Pte. (Acting Cpl.) S. Robertson (Cardiff).
 7460 Pte. (Temp. Serjt.) R. M. Robinson (Newcastle).
 497540 Pte. H. G. Root 2/3rd Field Ambulance (Stratford).
 80849 Pte. (Acting Serjt.) G. H. Saltern (Hethersett).
 42299 Pte. (Acting Cpl.) F. Short (Manchester).
 403333 Pte. (Lance-Cpl.) E. Shuttleworth (E.) 2nd Field Ambulance (Batley).
 64204 Pte. (Acting Cpl.) J. S. Smith (Calinton).
 8803 Pte. (Acting Serjt.) S. R. B. Smith (Sutton, Cambs).
 106900 Pte. C. H. Wain (Handley).
 54083 Pte. (Acting Cpl.) E. Walker (Sunderland).
 91281 Pte. (Acting Cpl.) G. Walton (Halifax).
 3628 Pte. (Acting Serjt.) W. Walthen (Brixton).
 495293 Pte. E. H. Wilson (Margate).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following appointments to the Most Honourable Order of the Bath, for valuable services rendered in connexion with Military Operations in Egypt, dated June 3, 1919:—

To be Additional Members of the Military Division of the Third Class, or Companions, of the said Most Honourable Order:—

Col. Henry Thomas Knaggs, C.M.G., M.B., late Royal Army Medical Corps.

Temp. Col. Francis Darby Boyd, C.M.G., M.D., F.R.C.P., Army Medical Service (Major Royal Army Medical Corps, Territorial Force).

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give directions for the following appointments to the Most Distinguished Order of St. Michael and Saint George for Services rendered in connexion with Military Operations in Egypt, dated June 3, 1919:—

To be Additional Members of the Third Class, or Companions of the said Most Distinguished Order:—

Lieut.-Col. and Brevet Col. (Temp. Col.) William Westropp White, C.B., M.D., Indian Medical Service.

Lieut.-Col. and Brevet Col. Allan James Macnab, C.B., F.R.C.S., Indian Medical Service.

Temp. Col. Henry Wade, D.S.O., M.D., F.R.C.S., Army Medical Service (Capt., Royal Army Medical Corps (Territorial Force)).

Temp. Col. Charles Coley Cheyes, O.B.E., M.D., F.R.C.S., Army Medical Service.

Lieut.-Col. George McIvor Campbell Smith, M.B., Indian Medical Service.

Lieut. Col. (Temp. Col.) William Purnell Gwynn, Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in Egypt:—

To be Commanders of the Military Division of the said Most Excellent Order:—

Temp. Lieut.-Col. James Johnstone Abraham, D.S.O., M.D., F.R.C.S., Royal Army Medical Corps.

Major and Brevet Lieut.-Col. (Temp. Lieut.-Col.) Herbert Vale Bagshaw, D.S.O., Royal Army Medical Corps.

Temp. Col. John Marshall Cowan, M.D., Army Medical Service.

To be Officers of the Military Division of the said Most Excellent Order:—

Capt. (Acting Major) James Alexander Hamilton Aitkin, M.B., Royal Army Medical Corps (Territorial Force).

Capt. Charles Henry Allen, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Capt. (Acting Major) Frederick Allan Barker, M.B., Indian Medical Service.

Temp. Capt. (Acting Major) Mark Bates, M.D., F.R.C.S., Royal Army Medical Corps.

Capt. (Acting Major) John James Egerton Biggs, Royal Army Medical Corps (Territorial Force).

Major James Morrison Gardiner Bremner, M.B., Royal Army Medical Corps (Territorial Force).

Temp. Capt. Adam Brown, M.B., Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) William Brown, M.D., Royal Army Medical Corps (Territorial Force).

Capt. Clement Clapton Chesterman, Royal Army Medical Corps.

Temp. Capt. Colin McKean Craig, M.D., Royal Army Medical Corps.

Temp. Capt. Norman Granville Walshe Davidson, F.R.C.S., Royal Army Medical Corps.

Capt. Acting Major Henry John Dunbar, M.D., Royal Army Medical Corps (Territorial Force).

Temp. Major Alexander Robert Ferguson, M.D., Royal Army Medical Corps.

Major Walter Harrington Fisher, M.D., Royal Army Medical Corps (Territorial Force).

Capt. William Thomson Graham, M.B., Royal Army Medical Corps.

Temp. Capt. Andrew Grant, M.B., Royal Army Medical Corps.

Capt. William Francis Theodore Haultain, M.C., M.B., Royal Army Medical Corps (Special Reserve).

Major (Temp. Lieut.-Col.) George Wykeham Heron, D.S.O., Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Alfred Buckley Hinde, Royal Army Medical Corps (Retired).

Capt. (Acting Major) Maurice James Holgate, M.B., Indian Medical Service.

Temp. Capt. William Christopher Jardine, M.B., Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Seymour Whitworth Jones, Indian Medical Service.
 Capt. (Acting Major) Charles Kerr, M.B., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Richard Ernest Howell Leach, M.D., Royal Army Medical Corps.
 Temp. Capt. George Leggat Leggat, M.B., Royal Army Medical Corps.
 Capt. Henry Roland L'Estrange, Royal Army Medical Corps.
 Capt. George James Linklater, M.B., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. Peter Lornie, M.D., Royal Army Medical Corps.
 Temp. Capt. Ronald MacDonald, M.D., Royal Army Medical Corps.
 Capt. and Brevet Major Alexander Stewart Murray MacGregor, M.D., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. Rom Charndr Malhotra, M.B., Indian Medical Service.
 Capt. (Acting Major) William Mathieson, Royal Army Medical Corps.
 Capt. (Acting Lieut.-Col.) Edward Meredyth Middleton, Royal Army Medical Corps.
 Lieut.-Col. Charles Milne, M.B., Indian Medical Service.
 Major (Acting Lieut.-Col.) Alfred William Moore, M.B., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. George Clement Neilson, M.B., Royal Army Medical Corps.
 Capt. (Acting Major) Rees Phillips, Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Lieut.-Col.) John Read Pooler, M.B., Royal Army Medical Corps (Territorial Force).
 Capt. (Temp. Major) Frederick Powlett Rankin, Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Arthur Ernest Rayner, M.D., Royal Army Medical Corps.
 Capt. Gerald Russell Rickett, M.D., Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) William Thomas Ritchie, M.D., Royal Army Medical Corps (Territorial Force).
 Capt. Andrew Robertson, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. John William Robertson, M.B., F.R.C.S., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) John William Smyth Secombe, Royal Army Medical Corps.
 Capt. Henry Samuel Crichton Starkey, Royal Army Medical Corps (Territorial Force).
 Lieut.-Col. George Herbert Stewart, M.B., Indian Medical Service.
 Capt. (Acting Major) John Strathearn, M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) Robert Henry Strong, M.B., Royal Army Medical Corps.
 Temp. Capt. James Robert Karrow Thomas, Royal Army Medical Corps.
 Temp. Capt. Eustace Thorp, Royal Army Medical Corps.
 Capt. (Temp. Major) Wilfred Warwick Treves, M.B., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) John Johnson Urwin, M.B., Indian Medical Service.
 Capt. Raymond Verel, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).
 Temp. Major Francis Martin Rouse Walshe, M.D., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Norman Septimus Walls, M.B., Indian Medical Service.
 Major (Acting Lieut.-Col.) Maurice Forbes White, M.B., Indian Medical Service.
 Temp. Capt. Ernest William Gilmore Young, M.C., M.B., Royal Army Medical Corps.
 To be Members of the Military Division of the said Most Excellent Order :—
 Temp. Lieut. Joseph Anastasi Anastasie, M.D., Royal Army Medical Corps.
 Temp. Qmr. and Capt. Ernest Henry Gann, Royal Army Medical Corps.
 Temp. Qmr. and Lieut. Walter Greaves, Royal Army Medical Corps.
 Temp. Qmr. and Capt. Ernest Thuillier, Royal Army Medical Corps.

AUSTRALIAN IMPERIAL FORCES.

To be a Commander of the Military Division of the said Most Excellent Order :—
 Lieut.-Col. (Temp. Col.) David Gifford Croll, Australian Army Medical Corps.
 To be Officers of the Military Division of the said Most Excellent Order :—
 Major Arthur Madgwick Davidson, Australian Army Medical Corps.
 Lieut.-Col. William Love Kirkwood, Australian Army Medical Corps.
 Lieut.-Col. Athelstan John Henton Saw, Australian Army Medical Corps.
 Col. Walter Ernest Summons, Australian Army Medical Corps.

War Office,
 June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the undermentioned rewards for distinguished service in connexion with Military Operations in Egypt, dated June 3, 1919 :—

To be Brevet Lieutenant-Colonel :—

(On Retired List, Reserve of Officers, Special Reserve, New Army, or Territorial Force, in the case of Officers belonging to these categories, as applicable.)

Major (Acting Lieut.-Col.) J. M. H. Conway, D.S.O., F.R.C.S., Royal Army Medical Corps.

Major (Acting Lieut.-Col.) W. F. Ellis, O.B.E., Royal Army Medical Corps.

Major (Acting Lieut.-Col.) J. L. Lunham, M.B., F.R.C.S., Indian Medical Service.

To be Brevet Major :—

(On Retired List, Reserve of Officers, Special Reserve, New Army, or Territorial Force, in the case of Officers, belonging to these categories, as applicable.)

Capt. (Acting Major) W. C. Paton, M.C., M.B., Indian Medical Service.

Temp. Capt. E. C. Williams, M.D., F.R.C.S., Royal Army Medical Corps.

AWARDED THE DISTINGUISHED SERVICE ORDER.

Major (Acting Lieut.-Col. Samuel Herbert Lee Abbott, M.B., Indian Medical Service, attached 14th Cavalry Brigade, Field Ambulance.

Major and Brevet Lieut.-Col. (Acting Lieut.-Col.) Herbert Michael Henry Melhuish, Indian Medical Service, commanding 111th Combined Field Ambulance.

Major (Acting Lieut.-Col.) Henry Thomas Samuel, Royal Army Medical Corps (Territorial Force), Commanding 170th Indian Combined Field Ambulance.

Australian Imperial Force.

Major (Temp. Lieut.-Col.) Clive Vallack Single, Australian Army Medical Corps, Commanding 4th Light Horse Field Ambulance.

Lieut.-Col. Gerald Eugene Macdonald Stuart, Australian Army Medical Corps, Commanding 3rd Light Horse Field Ambulance.

AWARDED THE MILITARY CROSS.

Capt. (Acting Major) Andrew Robert Fausset Clarke, M.B., Royal Army Medical Corps, Special Reserve, attached 154th Indian Combined Field Ambulance.

Capt. Josiah Walker, M.B., Royal Army Medical Corps (Territorial Force), attached 270th Brigade, Royal Field Artillery.

Capt. George Henry Hitchcock Waylen, Royal Army Medical Corps (Territorial Force), attached 1/4th Battalion Wilts Regiment (Territorial Force).

His Majesty the King has been graciously pleased to approve of the undermentioned rewards for distinguished service in connexion with the Military Operations in Egypt:—

AWARDED THE DISTINGUISHED CONDUCT MEDAL.

366065 Staff-Serjt. W. Morcombe, 1/2nd (Welsh) Field Ambulance, Royal Army Medical Corps (Territorial Force), attached 170th Indian Command Field Ambulance (Cardiff).

• His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-commissioned Officers and Men in recognition of valuable service rendered with the Forces in Egypt:—

32251 Serjt.-Major G. F. Lyon (Norwich).

14326 Temp. Serjt.-Major W. P. S. Morman (Battersea).

90994 Serjt.-Major E. C. Woodhouse (Hereford).

25570 Qmr.-Serjt. W. King (Anfield).

31101 Qmr.-Serjt. J. C. Palmer (Plumstead).

12651 Staff-Serjt. (Acting Serjt.-Major) R. H. Bennett (Cairo).

370011 Staff-Serjt. T. F. Foulkes (Cardiff).

36402 Staff-Serjt. (Acting Serjt.-Major) C. Gooding (Westerham).

44285 Staff-Serjt. J. B. Leach (Bradford).

505058 Staff-Serjt. T. H. Millar (York).

50203 Staff-Serjt. M. T. Morgan (Llantwit).

17553 Temp. Serjt.-Major J. R. Morfitt (Aldershot).

17699 Staff-Serjt. (Acting Serjt.-Major) C. Morrell (Farnham).

67199 Staff-Serjt. J. Simpson (E.) (Edinburgh).

1825 Staff-Serjt. (Temp. Qmr. Serjt.) A. G. Williams (Lichfield).

370058 Serjt. I. T. Austin (Cardiff).

79273 Serjt. (Acting Staff-Serjt.) F. J. Ellis (Edinburgh).

2210 Serjt. (Acting Staff-Serjt.) W. Fletcher (Derby).

29531 Serjt. F. E. Leach (Pinner).

51671 Serjt. H. J. Rowlands (Cheriton).

92384 Cpl. (Acting Serjt.) J. R. Allen (Bath).

50873 Cpl. (Staff-Serjt.) C. W. Anderson (London, E.C.).

103244 Cpl. (Acting Serjt.) W. W. Ball (Derby).

1985 Cpl. (Acting Staff-Serjt.) R. H. Brown (Portsmouth).

477147 Cpl. (Acting Serjt.) R. Reid (Dalston).

120891 Pte. (Acting Serjt.) A. L. Babbage (Plymouth).

96505 Pte. S. E. Bachrach (Finsbury Park).

85495 Pte. J. Bolton (Orrell).

362190 Pte. J. T. Byrne (Salford).

125397 Pte. (Acting Serjt.) E. Cartmell (Kirkoswald).

61567 Pte. J. N. Colley (Hull).

121275 Pte. (Acting Serjt.) A. V. Day (Bath).

94851 Pte. J. J. Dowse (Preston).

145525 Pte. W. Everitt (E.) (Ipswich).
 145524 Pte. J. Rayment (Rawtenstall).
 545358 Pte. A. Sharp (Earlsfield).
 125315 Pte. (Acting Serjt.) J. Unsworth (New Brighton).
 86951 Pte. D. Williamson (Bedford).
 104515 Pte. (Acting Serjt.) J. R. Woodcock (Baxenden).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

Lord Chamberlain's Office,
 St. James's Palace, S.W.

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following appointments to the Most Honourable Order of the Bath for valuable services rendered in connexion with Military Operations in Italy, dated June 3, 1919 :—

To be Additional Members of the Military Division of the Third Class, or Companions, of the said Most Honourable Order :—

Col. Thomas du Bedat Whaite, C.M.G., M.B. (late Royal Army Medical Corps).
 Col. John Vincent Forrest, C.M.G., M.B. (late Royal Army Medical Corps).
 Lieut.-Col. and Brevet Col. Arthur Chopping, C.M.G., Royal Army Medical Corps.
 Lieut.-Col. (Acting Col.) Ransom Pickard, C.M.G., M.D., Royal Army Medical Corps (T.F.).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in Italy :—

To be Commanders of the Military Division of the said Most Excellent Order :—

Lieut.-Col. (Temp. Col.) James Currie, Robertson, C.M.G., C.I.E., I.M.S. .

To be Officers of the Military Division of the said Most Excellent Order :—

Major (Acting Lieut.-Col.) Charles Bramhall, Royal Army Medical Corps.
 Capt. (Acting Major) Myer Coplans, D.S.O., M.D., Royal Army Medical Corps (T.F.).
 Temp. Capt. (Temp. Lieut.-Col.) Edward Alfred Gates, Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Thomas Holroyd Gibbon, M.D., Royal Army Medical Corps.
 Capt. (Acting Lieut.-Col.) Cyril Julian Gill, 9th Lancers (S.R.).
 Temp. Capt. John Jardine, M.D., F.R.C.S. Edin., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Reginald Hutchinson Lucas, M.C., Royal Army Medical Corps.

To be Members of the Military Division of the said Most Excellent Order.

Qmr. and Lieut. Joseph Cottle, Royal Army Medical Corps (T.F.).

Qmr. and Capt. Herbert John Furler, Royal Army Medical Corps (T.F.).

Temp. Qmr. and Lieut. William Langston, Royal Army Medical Corps.

11807 S. M. Joseph Levy, Royal Army Medical Corps.

War Office,

June 3 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the undermentioned rewards for distinguished service in connexion with Military Operations in Italy, dated June 3, 1919 :—

AWARDED THE DISTINGUISHED SERVICE ORDER.

Capt. (Temp. Major) Charles Joseph O'Reilly, M.C., M.D., 70th Field Ambulance, Royal Army Medical Corps.

Temp. Captain Allen Edgar Thompson, M.C., M.D., Royal Army Medical Corps, attached 8th Battalion York and Lancashire Regiment.

Capt. (Acting Lieut.-Col.) Edmund Wayne Vaughan, M.C., M.B., 23rd Field Ambulance, Royal Army Medical Corps.

AWARDED THE MILITARY CROSS.

Capt. Laurence Ball, M.B., Royal Army Medical Corps (Territorial Force), attached 1/4th Battalion, Royal Berks Regiment, Territorial Force.

Temp. Capt. John Burnett Matthews, Royal Army Medical Corps, attached 1/4th Battalion, Ox. and Bucks Light Infantry, Territorial Force.

His Majesty the King has been graciously pleased to approve of the undermentioned rewards for distinguished service in connexion with Military Operations with the Armies in Italy :—

AWARDED THE DISTINGUISHED CONDUCT MEDAL.

43296 Pte. W. Tomalin, 22nd Field Ambulance, Royal Army Medical Corps (Stoke Newington).

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the award of the Meritorious Service Medal to the undermentioned Warrant Officers, Non-

commissioned Officers and Men, in recognition of valuable services rendered with the British Forces in Italy:—

- 17260 Serjt.-Major G. W. Payne (Leicester).
 435001 Qmr.-Serjt. (Temp. Serjt.-Major) J. Rode, 1/1st South Midland Field Ambulance (Birmingham).
 18973 Staff-Serjt. (Acting Qmr.-Serjt.) J. J. Abbott, 23rd Field Ambulance (Hackney).
 2083 Staff-Serjt. (Acting Serjt.-Major) W. G. Pearce, 21st Field Ambulance (Enfield).
 18737 Staff-Serjt. (Acting Serjt.-Major) W. T. Stovold (Skegness).
 1970 Serjt. J. G. Brunt (Plymouth).
 34131 Serjt. (Acting Staff-Serjt.) A. O. Judd, 70th Field Ambulance (Kensington).
 83038 Pte. (Acting Cpl.) J. W. Hindley (Bolton).
 437176 Pte. (Lance Cpl.) F. V. Jephcott, 1/2nd South Midland Field Ambulance (Birmingham).
 439361 Pte. F. Jones 1/3rd South Midland Field Ambulance (Bristol).

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street.

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give directions for the following appointments to the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with Military Operations in the Balkans, dated June 3, 1919:—

To be Additional Members of the Third Class, or Companions, of the said Most Distinguished Order:—

Major and Brevet Lieut.-Col. (Acting Col.) Charles Walter Holden, D.S.O., Royal Army Medical Corps.

Major (Acting Lieut.-Col.) Joseph Ward, D.S.O., 1/1st Home Company Field Ambulance, Royal Army Medical Corps (Territorial Force).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in the Balkans:—

To be Commanders of the Military Division of the said Most Excellent Orders:—

Temp. Col. Leonard Stanley Dudgeon, C.M.G., American Medical Detachment.

Temp. Lieut.-Col. Arthur Wellesley Falconer, D.S.O., M.B., Royal Army Medical Corps (Territorial Force).

Capt. (Temp. Lieut.-Col.) Eric Gerald Gauntlett, D.S.O., M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Temp. Lieut.-Col. Charles Morley Wenyon, C.M.G., M.B., Royal Army Medical Corps.

To be Officers of the Military Division of the said Most Excellent Order:—

Capt. (Temp. Major) Arthur Skedling Cane, M.D., Royal Army Medical Corps.

Temp. Capt. Thomas Daily Cumberland, M.B., Royal Army Medical Corps.

Capt. Harold Arthur Thomas Fairbank, D.S.O., F.R.C.S., Royal Army Medical Corps.

Capt. Cuthbert Edmund Caulfield Ferry, Royal Army Medical Corps (Territorial Force).

Capt. Thomas Shirley Hele, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Herbert Ellison Rhodes James, C.B., C.M.G., F.R.C.S., Royal Army Medical Corps.

Temp. Capt. (Acting Major) John Arnold Jones, Royal Army Medical Corps.

Major (Temp. Lieut.-Col. Alexander Edward Kidd, Royal Army Medical Corps (Territorial Force).

Qmr. and Capt. Alfred John Hammond Knight, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Lieut.-Col.) Ryder Percival Nash, Royal Army Medical Corps (Territorial Force).

Temp. Capt. Frank Newey, Royal Army Medical Corps (Territorial Force).

Temp. Qmr. and Capt. Frederick Richardson, Royal Army Medical Corps.

Temp. Capt. James Robert Stott, Royal Army Medical Corps.

Capt. (Acting Major) Reginald Martin Vick, Royal Army Medical Corps (Territorial Force).

Temp. Capt. James Warnock, Royal Army Medical Corps.

Temp. Major Harold Waterlow Wiltshire, D.S.O., Royal Army Medical Corps.

Capt. (Acting Major) Lionel Dudley Woods, Royal Army Medical Corps.

Temp. Capt. Frederick Hugh Young, Royal Army Medical Corps.

War Office,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the undermentioned rewards for Distinguished Service in connexion with Military Operations in the Balkans, dated June 3rd, 1919.

To be Brevet Major:—

(On Retired List, Reserve of Officers, Special Reserve, New Army, or Territorial Force, in the case of Officers belonging to these categories, as applicable.)

Capt. (Acting Major) N. V. Lothian, M.C., M.B., Royal Army Medical Corps.

Capt. J. A. Sinton, V.C., M.B., Indian Medical Service.

Award Higher Rate of Pay under the Provisions of the Royal Warrant:—

Qmr. and Capt. R. Fairweather, 3rd London (City of London) Field Ambulance, Royal Army Medical Corps (Territorial Force).

AWARDED THE DISTINGUISHED SERVICE ORDER.

Capt. and Brevet-Major (Acting Lieut.-Col.) Percy Stanley Tomlinson, Royal Army Medical Corps.

AWARDED THE MILITARY CROSS.

Temp. Capt. Owen Albert Beaumont, Royal Army Medical Corps.

Temp. Capt. (Acting Major) Robert K. Birnie, M.B., Royal Army Medical Corps.

Temp. Capt. (Acting Major) Wilfred Victor Macaskie, M.B., Royal Army Medical Corps.

Capt. Alistair Cameron Macdonald, Royal Army Medical Corps, Special Reserve.

War Office,

June 3, 1919.

His Majesty the King has been graciously pleased to approve of the undermentioned rewards for Distinguished Service in connexion with Military Operations with the British Forces in the Balkans:—

AWARDED THE DISTINGUISHED CONDUCT MEDAL.

493007 Serjt. A H. Holtum 1st (Home Command) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Maidstone).

510131 Pte. F. Palmer, 1/2nd (London) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Kilburn, N.).

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-Commissioned Officers and Men, in recognition of valuable service rendered with the British Forces in the Balkans:—

ROYAL ARMY MEDICAL CORPS.

11812 Temp. Serjt-Major W. C. Banks (Swindon).

46222 Serjt.-Major S. D. Saville (Walthamstow).

28706 Staff-Serjt. J. G. Collier (Newport).

26956 Staff-Serjt. E. James (Aberaman).

45140 Serjt. T. C. Jones (Watford).

30857 Serjt. B. Lewin (Cambridge).

11424 Serjt. (Acting Staff-Serjt.) E. Weavis (Colchester).

47128 Cpl. (Acting Serjt.) A. J. Asplin (Westbourne Park).

78240 Cpl. (Acting Qmr.-Serjt.) A. L. Clarkson (Leeds).

21061 Cpl. (Acting Serjt.) E. F. Fincham (Hornsey).

16506 Cpl. C. Lark (Woolwich).

25230 Cpl. T. A. Wixted (Accrington).

8609 Pte. H. Godding (Slough).

46943 Pte. (Acting Cpl.) F. W. Pentlaud (Liverpool).

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give directions for the following appointments to the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with Military Operations in Mesopotamia, dated June 3, 1919:—

To be additional Member of the Third Class, or Companion, of the said Most Distinguished Order:—

Col. William Thomas Mould, late Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give orders for the following promotions in and appointments to the Most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in Mesopotamia:—

To be Commanders of the Military Division of the said Most Excellent Order :—
 Lieut.-Col. (Temp. Col.) Hugh Murray Morton, M.B., D.S.O., Royal Army Medical Corps.

Col. William Henderson Starr, C.B., C.M.G.

To be Officers of the Military Division of the said Most Excellent Order :—

Capt. John Maurice Hardman Campbell, Royal Army Medical Corps (Special Reserve).

Capt. Williams Corner, Royal Army Medical Corps (Special Reserve).

Major (Temp. Lieut.-Col.) Hamilton Maxwell Cruddas, C.M.G., Indian Medical Service.

Capt. and Brevet Major Leslie Dunbar, M.B., Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Wilfred James Dunn, Royal Army Medical Corps.

Lieut.-Col. John George Foster, M.B., Royal Army Medical Corps.

Lieut.-Col. Francis Edward Fremantle, Royal Army Medical Corps (Territorial Force).

Capt. Herbert Leslie Garson, M.C., Royal Army Medical Corps.

Lieut. (Temp. Capt.) Oswald Duke Jarvis, M.B., Royal Army Medical Corps.

Capt. Jordan Constantine John, M.B., Indian Medical Service.

Capt. (Acting Major) Donald Hector Colin MacArthur, M.B., Royal Army Medical Corps.

Temp. Capt. Archibald MacMillan, Royal Army Medical Corps.

Capt. and Brevet Major William McNaughton, M.B., Royal Army Medical Corps.

Capt. John Barre de Winton Molony, M.B., Indian Medical Service.

Major Edward Brodie Munro, M.D., Indian Medical Service.

Temp. Capt. Stuart Murray, Royal Army Medical Corps.

Major Harry William Russell, M.D., Royal Army Medical Corps.

Temp. Major (Acting Lieut.-Col.) Ernest William Skinner, Royal Army Medical Corps.

Lieut. (Temp. Capt.) John Smith Sloper, Royal Army Medical Corps.

Capt. (Acting Major) Edward Percival Allman Smith, M.C., Royal Army Medical Corps.

Temp. Capt. Cedric Rowland Taylor, M.B., Royal Army Medical Corps.

Major Norman Dunbar Walker, Royal Army Medical Corps.

Capt. William Linton Watson, Indian Medical Service.

Major (Acting Lieut.-Col.) Joseph Francis Whelan, D.S.O., M.B., Royal Army Medical Corps.

Major Vernon Northwood Whitmore, Indian Medical Service.

Capt. (Acting Major) William Edward Rees Williams, M.B., Indian Medical Service.

To be Members of the Military Division of the said Most Excellent Order :—

Temp. Qmr. and Lieut. John Sarel Moore, Royal Army Medical Corps.

Temp. Qmr. and Lieut. George Benisford Walker, M.C., Royal Army Medical Corps.

War Office,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to approve of the undermentioned rewards for distinguished services rendered in connexion with Military Operations in Mesopotamia, dated June 3, 1919 :—

To be Brevet Lieutenant-Colonel :—

(On Retired List, Reserve of Officers, Special Reserve, New Army or Territorial Force, in the case of Officers belonging to these categories, as applicable.)

Major (Acting Lieut.-Col.) F. P. Connor, D.S.O., F.R.C.S., Indian Medical Service.

Major (Acting Lieut.-Col.) R. Griffith, Royal Army Medical Corps (Territorial Force).

Major (Acting Lieut.-Col.) R. A. Lloyd, D.S.O., M.D., Indian Medical Service.

Major (Acting Lieut.-Col.) A. W. Sampey, Royal Army Medical Service.

To be Brevet Major :—

(On Retired List, Reserve of Officers, Special Reserve, New Army or Territorial Force, in the case of Officers belonging to these categories, as applicable.)

Capt. (Temp. Major) H. C. Todd, M.B., Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1.

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give orders for the following promotion in, and appointments to, the Most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in East Africa :—

To be Officers of the Military Division of the said Most Excellent Order :—

Capt. Herbert Lyndhurst Duke, Uganda Medical Service.

Capt. (Acting Major) Sydney Joseph Verner Furlong, M.B., Royal Army Medical Corps (Special Reserve).

Capt. (Acting Lieut.-Col.) James Dunlop Kidd, M.C., M.B., Royal Army Medical Corps.

To be Members of the Military Division of the said Most Excellent Order :—
 Temp. Capt. George Guy Butler, Royal Army Medical Corps.
 Temp. Capt. Andrew Crawford, Royal Army Medical Corps.
 Capt. John Isdale Greig, M.B., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) Henry Felix Mullan, Royal Army Medical Corps.
 Lieut. Joseph (Prince) Mussanji Walugembe, African Native Medical Corps.
 Temp. Capt. Edward John Joseph Quirk, West African Medical Service.
 Qmr. and Capt. James Sin Robertson, East African Medical Service.
 Qmr. and Capt. Robert Stanley, East African Medical Service.
 Temp. Capt. James Bowman Wilkie, M.B., Royal Army Medical Corps.

SOUTH AFRICAN FORCES.

Major (Temp. Lieut.-Col.) William Vincent Field, South African Medical Corps.
 Temp. Lieut.-Col. Jack Grinsell, South African Medical Corps.
 Capt. Robert Douglas Argyll Douglas, M.D., South African Medical Corps.
 Capt. Stuart Mackintosh McPherson, South African Medical Corps.

War Office,
 June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to approve of the undermentioned rewards for the distinguished service in connexion with Military Operations in East Africa, dated June 3, 1919 :—

To be Brevet Major :—

Capt. (Acting Lieut.-Col.) T. A. Weston, M.B., Royal Army Medical Corps.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Warrant Officers, Non-Commissioned Officers and Men in recognition of valuable services rendered in connexion with Military Operations with the Forces in East Africa :—

ROYAL ARMY MEDICAL CORPS.

21837 Serjt. H. Hammond (Walthamstow).
 19031 Serjt. J. J. Leahy (Devonport).
 18610 Cpl. (Acting Serjt.-Major) H. W. Hassard (Welwyn).

CENTRAL CHANCERY OF THE ORDERS OF THE KNIGHTHOOD.

St. James's Palace, S.W.1,
 June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give orders for the following appointments to the Most Excellent Order of the British Empire, for valuable services rendered in connexion with Military Operations in North Russia (Archangel Command) :—

To be Officers of the Military Division of the said Most Excellent Order :—

Capt. (Acting Major) William Nicol Watson Kennedy, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Thomas McDermott, Royal Army Medical Corps.

To be Members of the Military Division of the said Most Excellent Order :—

Lieut. Frederic Evans, Royal Army Medical Corps (Territorial Force).

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-Commissioned Officers and Men, in recognition of valuable services rendered with the British Forces in North Russia (Archangel Command) :—

ROYAL ARMY MEDICAL CORPS.

395044 Pte. W. H. Snow (Shipley).
 55041 Pte. J. Turner (Manchester).

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,
 June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give directions for the following appointments to the Most Distinguished Order of Saint Michael and Saint George for services rendered in connexion with Military Operations in North Russia (Murmansk Command), dated June 3, 1919 :—

To be an additional Member of the Third Class, or Companion, of the said Most Distinguished Order :—

Major (Acting Col.) Edward Lawton Moss, M.C., Royal Army Medical Corps.

War Office,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to approve of the undermentioned rewards for distinguished services rendered in connexion with Military Operations in North Russia (Murmansk Command), dated June 3, 1919:—

To be Brevet Major:—

(On Retired List, Reserve of Officers, Special Reserve, New Army or Territorial Force, in the case of Officers belonging to these categories, as applicable.)

Capt. H. Brian-Pearson, Royal Army Medical Corps (Territorial Force).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give orders for the following appointments to the Most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in North Russia (Murmansk Command):—

To be Officers of the Military Division of the said Most Excellent Order:—

Qmr. and Lieut. (Temp. Major) Barnard Holmes, Royal Army Medical Corps.

Capt. John Renwick, Royal Army Medical Corps.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-Commissioned Officers and Men, in recognition of valuable services rendered with the British Forces in North Russia (Murmansk Command):—

ROYAL ARMY MEDICAL CORPS.

38197 Pte. (Acting Serjt.) J. Pickston (Altrincham).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give orders for the following appointments to the Most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in the Aden Peninsula:—

To be Officer of the Military Division of the said Most Excellent Order:—

Major (Temp. Lieut.-Col.) Ian Macpherson Macrae, M.B., Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to make the following promotions in, and appointments to, the Most Exalted Order of the Star of India:—

To be Companion of the said Most Exalted Order:—

Col. Charles Mactaggart, C.I.E., Indian Medical Service, Inspector-General of Civil Hospitals, United Provinces.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to make the following appointments to the Most Eminent Order of the Indian Empire for services in connexion with the Military Operations in Mesopotamia:—

To be additional Companions of the said Most Eminent Order:—

Lieut.-Col. Ralph Henry Maddox, Indian Medical Service.

Major (Acting Lieut.-Col.) Arthur Brownfield Fry, D.S.O., Indian Medical Service.

Major (Acting Lieut.-Col.) Leonard Erskine Gilbert, Indian Medical Service.

Major (Acting Lieut.-Col.) William David Acheson Keys, M.D., Indian Medical Service.

Major (Temp. Lieut.-Col.) William Maurice Anderson, M.D., Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to make the following appointments to the Most Eminent Order of the Indian Empire for services in connexion with Military Operations in East Africa:—

To be additional Companions of the said Most Eminent Order :—
 Major (Acting Lieut.-Col.) Patrick Laurence O'Neill, Indian Medical Service.
 Capt. (Temp. Major) Gordon Grey Jolly, M.B., Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to make the following appointments to the Most Eminent Order of the Indian Empire for meritorious services connected with the War :—

To be additional Companion of the said Most Eminent Order :—

Lieut.-Col. Richard Arthur Needham, D.S.O., Indian Medical Service, Deputy Director-General, Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to make the following promotions in and appointments to the Most Eminent Order of the Indian Empire :—

To be Companions of the said Most Eminent Order :—

Lieut.-Col. William Dunbar Sutherland, Indian Medical Service, Imperial Serologist, Calcutta, and Chemical Examiner to the Government of Bengal.

Lieut.-Col. John Joseph Bourke, Indian Medical Service, Assay Master and Officiating Mint Master, Calcutta.

Lieut.-Col. John Stephenson, Indian Medical Service, Principal and Professor of Biology, Government College, Lahore, Punjab.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to make the following promotions in and appointments to the Most Excellent Order of the British Empire :—

To be officers of the Civil Division of the said Most Excellent Order :—

Major Clayton Alexander Francis Hingston, Indian Medical Service, Personal Assistant to the Surgeon-General with the Government of Madras.

Lieut.-Col. Eugene John O'Meara, Indian Medical Service, Principal Medical School, Agra, United Provinces.

War Office,

June 5, 1919.

The following dispatch has been received by the Secretary of State for War from General Sir E. H. Allenby, G.C.B., G.C.M.G., Commander-in-Chief, Egyptian Expeditionary Force :—

General Headquarters,

March 5, 1919.

SIR,—I have the honour to forward herewith a list of Officers, Nurses, Other Ranks and Civilians, whom I consider worthy of mention for their services during the period from September 19, 1918, to January 31, 1919.

I have the honour to be, Sir,

Your most obedient Servant,

E. H. H. ALLENBY, *General.*

Commander-in-Chief, Egyptian Expeditionary Force.

COMMANDS AND STAFF.

Temp. Major (Acting Lieut.-Col.) J. J. Abraham, D.S.O., M.D., F.R.C.S., Royal Army Medical Corps.

Major and Brevet Lieut.-Col. (Acting Lieut.-Col.) H. V. Bagshawe, D.S.O., Royal Army Medical Corps.

Col. T. B. Peach, C.M.G., Army Medical Service.

Temp. Major G. F. Bird, M.C., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) C. E. P. Fowler, O.B.E., F.R.C.S., Royal Army Medical Corps Reserve of Officers (retired pay).

Lieut.-Col. (Temp. Col.) W. P. Gwynn, Royal Army Medical Corps.

Major (Acting Lieut.-Col.) G. W. Heron, D.S.O., Royal Army Medical Corps.

Col. H. T. Knaggs, C.M.G., M.B., Army Medical Service.

Col. (Temp. Major-Gen.) R. H. Luce, C.B., C.M.G., V.D., M.B., F.R.C.S., Army Medical Service (Territorial Force Reserve).

Capt. and Brevet Major (Temp. Major) A. S. M. Macgregor, M.D., Royal Army Medical Corps (Territorial Force).

Capt. (Acting Major) F. P. Rankin, Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) E. B. Dowsett, D.S.O. Royal Army Medical Corps (Territorial Force).

Lieut.-Col. (Temp. Col.) E. P. Sewell, C.M.G., D.S.O., M.B., Royal Army Medical Corps.

Capt. (Temp. Major) R. O. Sibley, M.D., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. G. E. F. Stammers, O.B.E., Royal Army Medical Corps.

Capt. (Acting Major) W. W. Treves, M.B., F.R.C.S., Royal Army Medical Corps.

ARMY MEDICAL SERVICE AND ROYAL ARMY MEDICAL CORPS.

Capt. W. E. Adam, M.C., M.D.

Temp. Capt. W. R. Allen, M.B.

Lieut.-Col. W. L. Baker.

Temp. Capt. (Acting Major) M. Bates, M.B., F.R.C.S.

Temp. Capt. J. B. Binns.

Temp. Capt. J. T. Bleasdel.

Temp. Capt. C. H. B. Booth.

Temp. Col. F. D. Boyd, C.M.G. M.D., F.R.C.P. (Major, Royal Army Medical Corps (Territorial Force)).

Temp. Hon. Capt. R. M. Bradley, M.D.

Temp. Capt. F. Brickwell, M.B.

Capt. E. A. P. Brock.

Temp. Capt. A. Brown, M.B.

Temp. Capt. W. T. Buchan, M.B.

Temp. Capt. W. Campbell, M.B.

Capt. E. Catford.

Temp. Col. C. C. Choyce, C.B.E., M.D., F.R.C.S.

Temp. Capt. H. Christal, M.B.

Qmr. and Capt. T. E. Coggon, M.C.

Qmr. and Capt. W. P. Conolly.

Temp. Capt. J. H. Cooke, M.B.

Temp. Major W. E. M. Corbett (Major, 1/5th Battalion, Devon Regiment (Territorial Force)).

Temp. Capt. D. Corry, M.B.

Temp. Col. J. M. Cowan, M.D. (Major, Royal Army Medical Corps (Territorial Force)).

Temp. Capt. C. McK. Craig, M.D.

Temp. Capt. N. G. W. Davidson, F.R.C.S.

Temp. Major A. R. Ferguson, M.D.

Temp. Capt. W. Forsyth, M.B.

Temp. Capt. N. S. Gilchrist, O.B.E., M.D., attached Royal Air Force.

Temp. Lieut.-Col. J. Godding, O.B.E., T.D. (Lieut.-Col., 17th Battalion, London Regiment).

Temp. Lieut. E. Gofton, M.B.

Capt. W. T. Graham, M.B.

Temp. Capt. (Acting Major) A. Grant, M.B.

Temp. Capt. B. G. Gutteridge.

Temp. Capt. J. R. Hewetson.

Major (Acting Lieut.-Col.) A. B. Hinde.

Temp. Capt. A. N. Hodges, M.B.

Qmr. and Capt. J. F. Hughes.

Temp. Capt. W. C. Jardine, M.B.

Temp. Capt. J. Jeffrey, M.B., F.R.C.S.

Temp. Capt. R. M. Johnston, M.B.

Temp. Capt. (Acting Major) J. S. Joly, M.D., F.R.C.S.

Temp. Capt. (Acting Major) R. E. H. Leach, M.D.

Temp. Capt. G. L. Leggat, M.B.

Capt. H. R. L'Estrange.

Temp. Capt. P. Lornie, M.D.

Temp. Capt. R. Macdonald, M.D.

Temp. Capt. (Acting Major) A. T. Mackenzie, M.D., F.R.C.S.

Capt. and Brevet Major (Acting Major) W. E. Marshall, M.C., M.B.

Capt. F. W. Matheson, M.B.

Capt. (Acting Major) W. Mathieson.

Temp. Capt. R. B. F. McKail, M.B.

Capt. (Acting Lieut.-Col) E. M. Middleton.
 Temp. Qmr. and Capt. E. F. Millington.
 Temp. Qmr. and Lieut. E. M. Mitchell.
 Temp. Capt. R. M. Morison, M.B.
 Temp. Capt. E. C. Myott, M.D.
 Temp. Capt. G. C. Neilson, M.B.
 Temp. Capt. H. North.
 Temp. Capt. (Acting Major) A. E. Rayner, M.D.
 Temp. Capt. H. M. Reeve, M.B.
 Temp. Capt. (Acting Major) J. M. Renton, M.B., F.R.C.S.
 Temp. Hon. Capt. B. McB. Richardson, M.B.
 Major (Acting Lieut.-Col) F. E. Roberts, D.S.O.
 Temp. Capt. J. W. Robertson, M.B., F.R.C.S.
 Temp. Capt. S. S. Rosebery, M.B.
 Temp. Capt. R. N. Salaman, M.D.
 Major (Acting Lieut.-Col.) J. W. S. Seccombe.
 Temp. Capt. J. D. G. Stewart, M.B.
 Temp. Capt. (Acting Major) R. H. Strong, M.B.
 Temp. Capt. J. R. K. Thomson.
 Temp. Capt. E. Thorp.
 Temp. Col. H. Wade, D.S.O., M.D., F.R.C.S. (Capt., Royal Army Medical Corps
 (Territorial Force)).
 Temp. Major F. M. R. Walshe, M.D.
 Temp. Capt. (Acting Major) G. B. Warburton, M.B.
 Temp. Capt. (Acting Major) J. N. Wheeler, M.B.
 Temp. Capt. R. J. Wilson, M.B.
 Temp. Capt. J. Wright, M.B.
 Temp. Capt. H. D. Wyatt.
 Temp. Capt. E. W. G. Young, M.C., M.B.
 84038 Pte. A. V. Allen.
 36641 Serjt. A. A. Aston, 165th Indian Combined Field Ambulance.
 104986 Pte. (Acting Lance-Cpl.) G. Barnes, 36th Stationary Hospital.
 58674 Cpl. (Acting Serjt.) H. B. Bell, 88th General Hospital.
 112232 Pte. (Acting Cpl.) A. Bond, No. 8 Base Depot.
 26859 Pte. W. F. Brickwood, 3rd Egyptian Stationary Hospital.
 25273 Staff-Serjt. J. Collins, 47th Stationary Hospital.
 67891 Serjt. W. A. Coutts, 69th General Hospital.
 12730 Pte. (Temp. Cpl.) A. C. Croft.
 84030 Pte. E. Cross.
 69097 Serjt. R. C. Davis.
 21224 Pte. (Acting Cpl.) J. Dixey.
 60541 Pte. (Acting Lance-Cpl.) T. B. Donaldson.
 83991 Pte. (Acting Cpl.) W. Douglas, 54th Casualty Clearing Station.
 137777 Pte. (Acting Serjt.) J. P. Dunbar, 39th Indian General Hospital.
 35683 Pte. J. E. Edwards, attached 7th (Meerut) Div. M.G. Battalion.
 10510 Serjt.-Major W. T. Eldergill, 26th Stationary Hospital.
 25875 Pte. G. E. Finn, 36th Stationary Hospital.
 83511 Serjt. H. Firth, No. 8 Base Depot.
 123201 Pte. (Acting Serjt.) B. Foggett, attached 24th Indian Casualty Clearing Hos-
 pital.
 545441 Pte. (Acting Serjt.) H. W. Franks, 30th Sanitary Section.
 53449 Cpl. (Acting Staff-Serjt.) L. Freeborough, 68th General Hospital.
 18634 Qrm.-Serjt. F. H. Galton.
 81022 Pte. G. Geddes, attached 1/2nd (E. Ang.) Field Ambulance.
 79205 Pte. T. R. Goddard, 2nd Military Laboratory.
 11764 Pte. A. V. Gooch.
 67737 Qmr.-Serjt. R. Grant, 69th General Hospital.
 545442 Pte. (Acting Serjt.) A. Hadler, 30th Sanitary Section.
 87489 Pte. G. T. Haines, 41st Indian General Hospital.
 59802 Staff-Serjt. A. Hilton, "M" Special Hospital.
 53131 Qmr.-Serjt. G. C. Hitchcock, attached 3rd Egyptian Stationary Hospital.
 5911 Cpl. (Acting Staff-Serjt.) H. J. Howard.
 127377 Pte. G. T. Inglis, 39th Indian General Hospital.
 94555 Pte. S. J. Ireland, 68th General Hospital.
 99704 Pte. W. Jones, 21st General Hospital.
 103358 Pte. (Acting Lance-Cpl.) F. Lister, 36th Stationary Hospital.
 25443 Staff-Serjt. C. L. London, 26th Stationary Hospital.

118942 Pte. P. T. Matthews, 47th Stationary Hospital.
 545793 Pte. G. F. Mitchell, 90th Sanitary Section.
 17825 Staff-Serjt. N. Moore, attached 110th Indian Combined Field Ambulance.
 32264 Pte. (Acting Cpl.) E. R. Moss.
 18251 Staff-Serjt. E. E. Ovendon, attached 123rd Indian Combined Field Ambulance.
 63002 Pte. (Acting Serjt.) J. R. Owen, attached 7th B.R.C.S. Convalescent Hospital.
 22244 Cpl. E. Pearson.
 6060 Cpl. (Temp. Staff-Serjt.) R. W. G. Pegg.
 1785 Serjt. W. J. Phillips, attached 39th Indian General Hospital.
 78982 Pte. (Acting Cpl.) R. Price.
 28629 Serjt. (Acting Staff-Serjt.) F. Rigby, 27th General Hospital.
 27726 Cpl. H. Rimmer, 24th Stationary Hospital.
 26666 Staff-Serjt. T. M. Sayers, 2nd Prince of Wales Hospital.
 93403 Serjt. J. Sharpe.
 83932 Pte. A. C. Simons.
 25663 Cpl. E. Steele, 24th Stationary Hospital.
 545122 Staff-Serjt. H. Steele, 24th Stationary Hospital.
 34463 Pte. (Acting Lance-Cpl.) R. Stephens, 19th General Hospital.
 40229 Pte. A. Stewart, 87th General Hospital.
 21126 Cpl. J. McK. Symonds, 66th Casualty Clearing Station.
 83110 Pte. E. N. Taylor, 15th Combined Clearing Hospital.
 56343 Staff-Serjt. C. Thompson, 78th General Hospital.
 22289 Cpl. E. I. Tuck, attached 29th Indian General Hospital.
 75439 Pte. E. Wallas.
 11761 Serjt.-Major F. S. Walls, 17th General Hospital.
 24945 Pte. (Acting Serjt.) E. H. Warren, 41st Indian General Hospital.
 123684 Pte. A. W. Wells, 124th Sanitary Section.
 51767 Cpl. (Acting Serjt.) F. West, 46th Hospital Train.
 38489 Cpl. A. H. Wilson, 47th Stationary Hospital.
 119744 Cpl. J. Wilson, 6th Egyptian Detention Hospital.
 100206 Pte. (Acting Lance-Cpl.) T. Wilson, 27th General Hospital.
 66780 Pte. S. Wiltshire, 69th General Hospital.
 58865 Cpl. (Acting-Serjt.) W. H. S. A. Winslet.
 76970 Serjt. (Acting Staff-Serjt.) J. H. Worthington, 137th Indian Stationary Hospital.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. R. B. Campion.
 Capt. C. C. Chesterman.
 Capt. D. M. M. Fraser, M.B.
 Capt. W. F. T. Haultain, M.C., M.B.
 Capt. T. P. Inglis, M.B.
 Capt. (Temp. Lieut.-Col.) P. S. Vickerman, O.B.E., M.B., F.R.C.S.
 Capt. O. Williams.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Capt. (Serjt.-Major) J. A. H. Aitken, M.B.
 Capt. C. H. Allen, M.B., F.R.C.S.
 Capt. (Acting Lieut.-Col.) H. S. Beadles.
 Capt. (Acting Major) J. J. E. Biggs.
 Major J. M. G. Bremner, M.B.
 Capt. M. Brennan, M.B.
 Capt. (Acting Lieut.-Col.) W. Brown, M.B.
 Capt. M. T. G. Clegg.
 Capt. H. M. McC. Coombs, M.B.
 Capt. (Acting Major) H. J. Dunbar, M.D., F.R.C.S.
 Major W. H. Fisher, M.D.
 Capt. (Acting Major) W. T. Gardiner, M.C., M.B., F.R.C.S.
 Capt. R. F. Gerrard.
 Capt. A. H. Hasnip.
 Capt. H. F. Humphreys, M.C., M.B.
 Lieut. H. Jessop.
 Capt. E. S. Johnson, M.C., M.D.
 Capt. J. D. Jones.
 Capt. (Acting Major) C. Kerr, M.B.
 Capt. G. J. Linklater, M.B.
 Major (Acting Lieut.-Col.) A. W. Moore, M.B.
 Capt. (Acting Major) R. Phillips, M.D.

Capt. (Acting Lieut.-Col.) J. R. Pooler, M.B.
 Capt. (Acting Major) J. J. Rainforth, M.B., F.R.C.S.
 Capt. G. R. Rickett, M.D.
 Capt. (Acting Major) W. T. Ritchie, M.D.
 Capt. A. Robertson.
 Capt. (Acting Major) G. E. J. A. Robinson, M.C., M.D.
 Major (Acting Lieut.-Col.) H. T. Samuel.
 Capt. (Acting Major) W. Scott, M.B.
 Capt. (Acting Major) A. L. Sharpin.
 Major A. B. Sloan, M.D.
 Capt. W. S. Soden.
 Capt. H. S. C. Starkey.
 Capt. (Acting Major) J. Strathearn, M.D., F.R.C.S.
 Capt. W. T. Torrance.
 Capt. R. Verel, M.B., F.R.C.S.
 Major (Acting Lieut.-Col.) W. D. Watson.
 Capt. K. B. Williamson.
 545687 Staff-Serjt. F. T. Back, 80th Sanitary Section.
 473508 Serjt.-Major C. Baker, 2/1st (E. Ang.) Field Ambulance.
 546058 Cpl. W. H. Bamford, H.Q., Desert Mounted Corps.
 444001 Serjt. G. J. Banks, 2nd Southern General Hospital, attached 2nd Military Laboratory.
 479018 Staff-Serjt. H. Bray, 66th Casualty Clearing Station.
 527297 Lance-Cpl. (Acting Cpl.) R. Chaloner, 1st (City of London) Sanitary Company, attached 18th Sanitary Section.
 479008 Pte. (Acting Staff-Serjt.) J. W. Clarke, 54th Casualty Clearing Station.
 475447 Pte. E. Custance.
 324005 Serjt. (Acting Qmr.-Serjt.) H. F. Deas, 2nd Scottish General Hospital, attached 44th Stationary Hospital.
 400304 Pte. (Acting-Serjt.) R. B. Estill.
 416037 Staff-Serjt. J. F. Fawcett (Notts and Derby), Mounted Brigade Field Ambulance.
 536656 Pte. (Acting Serjt.) F. L. Foulkes, 2/5th (Lond.) Field Ambulance, attached 71st General Hospital.
 546009 Staff-Serjt. H. J. Franklin (2nd (Lond.) Sanitary Company, attached 29th Sanitary Section.
 527337 Staff-Serjt. R. J. Gurney (1st (Lond.) Sanitary Company, attached 19th Sanitary Section.
 492051 Serjt. A. L. Hawkins (South-Eastern), Mounted Brigade Field Ambulance.
 316454 Qmr.-Serjt. E. J. Henderson, 2nd Scottish General Hospital, attached 7th Prince of Wales Hospital.
 393017 Serjt. W. Henderson, 47th Stationary Hospital.
 527712 Cpl. N. E. Hiscocks, 89th Sanitary Section.
 477018 Temp. Serjt.-Major W. T. Holbrook, 1/3rd (E. Ang.) Field Ambulance.
 366245 Pte. (Acting Cpl.) H. L. Jones, (2nd (Welsh) Field Ambulance, attached 66th Casualty Clearing Station.
 538039 Serjt. (Acting Staff-Serjt.) P. F. King, 2/6th (Lond.) Field Ambulance, attached 179th Indian Combined Field Ambulance.
 495252 Temp. Serjt.-Major A. G. Knight, 2nd (H.C.) Field Ambulance, attached 26th Stationary Hospital.
 467150 Pte. (Acting Staff-Serjt.) J. W. J. Leighton, 5th Southern General Hospital, attached 32nd Mob. Bac. Laboratory.
 534465 Cpl. B. A. Lewis, 3rd Prince of Wales Hospital.
 318344 Temp. Serjt.-Major J. F. MacFarlane, 2nd (Low) Field Ambulance, attached 36th Stationary Hospital.
 479040 Pte. A. E. Mace, 66th Casualty Clearing Station.
 473349 Pte. G. J. Mann, 2/1st (E. Ang.) Field Ambulance.
 366196 Pte. W. Manning, 1/2nd (Welsh) Field Ambulance, attached 113th Indian Combined Field Ambulance.
 545452 Pte. (Acting Serjt.) D. F. Maxwell, 124th Sanitary Section.
 473399 Pte. (Acting Cpl.) W. G. Meacham, 1st (E. Ang.), Field Ambulance, attached 6th Military Laboratory.
 318321 Serjt. J. Muir, 3/2nd (Low.) Field Ambulance, attached 69th General Hospital.
 416108 Serjt. W. H. Nicholls (Notts and Derby), Mounted Brigade Field Ambulance, attached 76th Casualty Clearing Station.
 434002 Temp. Serjt.-Major F. W. Nichols, 2nd (S. Mid.) Mounted Brigade Field Ambulance, attached Stationary Hospital.
 324006 Qmr.-Serjt. W. Paxton, 2nd Scottish General Hospital, attached No. 5 Base Depot

527728 Pte. L. Penney, 1st (Lond.) Sanitary Company, attached 113th Sanitary Section.
 366193 Temp. Serjt.-Major W. J. Phelps, 2nd (Welsh) Field Ambulance, attached 48th Stationary Hospital.
 364218 Pte. T. Poole, 1/1st (Welsh) Field Ambulance.
 545008 Qmr.-Serjt. L. Skeeles, 114th Sanitary Section.
 318009 Staff-Serjt. J. Sloss, 1/2nd (Low.) Field Ambulance, attached 69th General Hospital.
 472005 Temp. Serjt.-Major T. W. Smith, Eastern Mounted Brigade Field Ambulance, attached 78th General Hospital.
 473428 Pte. A. Tanner, 1st (E. Ang.) Field Ambulance, attached Indian Cavalry Base Depot.
 434011 Serjt. (Acting Staff-Serjt.) W. E. S. Taylor, 2nd (S. Mid.) Mounted Brigade Field Ambulance, attached 10th Cavalry Brigade Combined Field Ambulance.
 368120 Pte. D. M. Thomas, 1/2nd (Welsh) Field Ambulance, attached 171st Indian Combined Field Ambulance.
 545290 Serjt. (Acting Qmr.-Serjt.) E. Turner, 2nd (London) Sanitary Company, attached 137th Indian Stationary Hospital.
 527752 Serjt. (Acting Staff-Serjt.) V. C. Watts, 1st (London) Sanitary Company, attached 95th Sanitary Section.
 444082 Serjt. F. C. Wembridge, 2nd Southern General Hospital.

War Office.

June 5, 1919.

The following dispatch has been received by the Secretary of State for War from General F. R. Earl of Cavan, K.P., K.C.B., M.V.O., Commander-in-Chief of the British Forces in Italy:—

General Headquarters, Italy.

January 18, 1919.

SIR,—I have the honour to submit a list of names of those Officers, Ladies, Non-commissioned Officers and Men serving, or who have served, under my command during the period September 15, 1918, to December 31, 1918, whose distinguished and gallant services and devotion to duty I consider deserving of reward.

I have the honour to be, Sir,

Your obedient Servant,

CAVAN, General,

Commander-in-Chief, The British Forces in Italy.

Col. T. Du B. Whaite, C.M.G., M.B., Army Medical Service (formerly Royal Army Medical Corps).

ARMY MEDICAL SERVICE.

Col. S. A. Archer, C.M.G. (formerly Royal Army Medical Corps).
 Lieut.-Col. and Brevet Col. A. Chopping, C.M.G., Royal Army Medical Corps.
 Capt. (Acting Major) M. Coplans, D.S.O., M.D., Royal Army Medical Corps (Territorial Force).
 Col. J. V. Forrest, C.M.G., M.B. (formerly Royal Army Medical Corps).
 Temp. Capt. (Acting Major) R. H. Lucas, M.C., Royal Army Medical Corps.
 Major-Gen. F. R. Newland, C.B., C.M.G., M.B. (formerly Royal Army Medical Corps).
 Col. R. Pickard, C.M.G., T.D., M.D., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. A. Shelley, M.B., Royal Army Medical Corps.
 Capt. (Acting Major) T. O. Thompson, M.D., Royal Army Medical Corps.
 Temp. Col. C. G. Watson, C.M.G., F.R.C.S.
 Capt. and Brevet Major (Acting Col.) W. G. Wright, D.S.O., Royal Army Medical Corps.

ROYAL ARMY MEDICAL CORPS.

Capt. (Acting Lieut.-Col.) J. J. H. Beckton, 69th Field Ambulance.
 Major and Brevet Lieut.-Col. (Temp. Lieut.-Col.) J. G. Bell, D.S.O., M.B., 39th Casualty Clearing Station.
 Qmr. and Capt. (Temp. Major) A. Bennett, M.C., 14th Base Depot Medical Stores.
 Major (Acting Lieut.-Col.) C. Bramhall, 51st Stationary Hospital.
 Temp. Capt. R. V. Dolbey, F.R.C.S., 24th Casualty Clearing Station.
 Lieut.-Col. M. W. Falkner, F.R.C.S.I., 38th Stationary Hospital.
 Temp. Capt. (Acting Lieut.-Col.) E. A. Gates.
 Major (Acting Lieut.-Col.) T. H. Gibbon, M.D., 79th General Hospital.
 Capt. (Acting Lieut.-Col.) J. G. Gill, D.S.O., M.C., M.B., Commanding 71st Field Ambulance.
 Qmr. and Temp. Lieut. T. H. Griggs, 21st Field Ambulance.
 Temp. Capt. J. Jardine, M.D., F.R.C.S. Edin., 24th Casualty Clearing Station.

Temp. Capt. (Acting Major) H. R. Macintyre, D.S.O., M.C., M.D., 69th Field Ambulance.

Temp. Capt. S. Marle, attached 1/2nd (S. Mid.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. K. D. Melville, M.D., 62nd General Hospital.

Temp. Capt. (Acting Major) R. Millar, M.D., 9th Casualty Clearing Station (Capt., Canadian Army Medical Corps).

Capt. (Temp. Major) C. J. O'Reilly, M.C., 70th Field Ambulance.

Temp. Capt. W. Parker, M.C., M.B., 79th General Hospital.

Temp. Capt. C. H. G. Prance, 21st Field Ambulance.

Temp. Lieut.-Col. C. D. Pye-Smith, D.S.O., M.C., M.B., F.R.C.S., 24th Casualty Clearing Station.

Temp. Capt. A. E. Thompson, M.C., M.D., attached 8th Battalion Yorks and Lincs. Regiment.

Capt. (Acting Lieut.-Col.) E. W. Vaughan, M.C., M.B., 23rd Field Ambulance.

Temp. Capt. A. G. Wilson, attached 51st Stationary Hospital "E."

43418 Serjt. (Acting Serjt.-Major) J. B. Bell, 6th Native Laboratory Hospital.

17 Serjt. A. C. Berry, 21st Field Ambulance.

104110 Pte. E. G. Castle, attached Headquarters, 23rd Division.

15671 Qmr.-Serjt. (Temp. Serjt.-Major) B. W. Cole, 51st Stationary Hospital.

90476 Cpl. (Acting Serjt.) N. Fletcher, attached Lines of Communication.

90781 Serjt. J. A. Goodman, 70th Field Ambulance.

19029 Staff-Serjt. (Acting Serjt.-Major) R. E. Harvey, 39th Casualty Clearing Station.

24 Staff-Serjt. P. H. Haynes, attached Base Area.

58429 Pte. J. Hurdman, 70th Field Ambulance.

89155 Serjt. (Acting Qmr.-Serjt.) C. H. Lee, 38th Stationary Hospital.

31909 Pte. (Acting Cpl.) W. H. Lewis, 71st Field Ambulance.

7897 Pte. J. A. Maloney, 22nd Field Ambulance.

40058 Pte. F. Osborne, 71st Field Ambulance.

417461 Qmr.-Serjt. (Temp. Serjt.-Major) F. J. Steele, 11th General Hospital.

59439 Pte. J. Tabernacle, 69th Field Ambulance.

6587 Cpl. C. Wright, attached Headquarters, 7th Division.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. W. Broughton-Alcock, 11th General Hospital.

Capt. (Acting Major) H. H. Brown, attached 1/1st (S. Mid.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Capt. H. P. Gabb, M.C., 22nd Field Ambulance.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Capt. K. S. Beken, 2nd (Lond.) Sanitary Company (Commanding 75th Sanitary Section)

Major (Temp. Lieut.-Col.) G. H. L. Hammerton, C.M.G., D.S.O., 9th Casualty Clearing Station.

Capt. (Acting Major) C. E. K. Herapath, M.C., M.B., 1/3rd (S. Mid.) Field Ambulance.

Qmr. and Lieut. J. J. Llewellyn, 23rd Field Ambulance.

Capt. (Acting Lieut.-Col.) P. Moxey, 21st Field Ambulance.

Capt. C. C. Robinson, M.B., attached 1/7th Battalion Royal Warwick Regiment (Territorial Force).

439,128 Pte. J. Andrews, 1/3rd (S. Mid.) Field Ambulance.

437192 Serjt. E. J. Bryden, 1/2nd (S. Mid.) Field Ambulance.

528274 Pte. (Acting Serjt.) R. B. Ling, 110th Sanitary Section.

435196 Pte. (Acting Lance-Cpl.) W. H. Walters, 1/1st (S. Mid.) Field Ambulance.

War Office,

June 5, 1919.

The following dispatch has been received by the Secretary of State for War from Lieutenant-General Sir G. F. Milne, K.G.B., K.C.M.G., D.S.O., Commanding-in-Chief, British Salonika Force:—

General Headquarters,

British Salonika Force,

Constantinople,

March 9, 1919.

SIR.—I have the honour to submit herewith a list of names of the Officers, Warrant Officers, Non-Commissioned Officers, Men and Nursing Staff, whom I desire to bring to your notice for their distinguished and gallant services during the period from October 1, 1918, to March 1, 1919.

I have the honour to be, Sir,

Your obedient servant,

(Signed) G. F. MILNE, Lieut.-General,

Commanding-in-Chief, British Salonika Force.

Capt. (Acting Major) A. S. Cane, M.D., Royal Army Medical Corps.
 Capt. and Brevet Major C. A. Cardwell, O. & B.L.I. (Special Reserve).
 Major and Brevet Lieut.-Col. (Acting Col.) C. W. Holden, D.S.O., Royal Army Medical Corps.

Major-Gen. M. P. C. Holt, K.C.M.G., C.B., D.S.O., Army Medical Service.
 Capt. (Acting Major) N. V. Lothian, M.C., M.B., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) F. S. Penny, C.M.G., D.S.O., M.B., Royal Army Medical Corps.

ARMY MEDICAL SERVICE.

Temp. Col. L. S. Dudgeon, C.M.G., F.R.C.P.

ROYAL ARMY MEDICAL CORPS.

Temp. Capt. (Acting Major) H. B. Atlee, M.C., M.D.
 Temp. Capt. H. S. Banks, M.B.
 Temp. Capt. W. Barritt.
 Temp. Capt. O. A. Beaumont.
 Temp. Capt. (Acting Major) R. K. Birnie, M.B.
 Temp. Capt. J. Brydon, F.R.C.S.
 Temp. Capt. (Acting Major) S. Campbell, M.B.
 Temp. Capt. T. D. Cumberland, M.B.
 Temp. Capt. H. H. L. Ellison.
 Temp. Capt. R. R. Elworthy, O.B.E., M.D.
 Temp. Capt. A. E. Fiddian.
 Temp. Capt. C. Y. Flewitt, M.B.
 Temp. Capt. (Acting Major) W. Haward, M.B.
 Temp. Capt. H. E. Heapy, M.D.
 Temp. Capt. R. Heaton.
 Temp. Capt. (Acting Major) J. V. Holmes, M.B.
 Temp. Capt. G. P. B. Huddy.
 Temp. Capt. (Acting Major) J. Hughston, M.B. (died of wounds).
 Lieut.-Col. H. E. R. James, C.B., C.M.G., F.R.C.S.
 Temp. Capt. (Acting Major) J. A. Jones, M.B., F.R.C.S.
 Temp. Capt. W. Landsborough, M.B.
 Qmr. and Temp. Capt. F. G. Lovell.
 Temp. Capt. (Acting Major) W. V. Macaskie, M.B.
 Temp. Capt. (Acting Major) G. D. Mathewson, M.B.
 Capt. (Acting Major) O. R. McEwen.
 Temp. Capt. H. L. Messenger, M.C.
 Temp. Capt. F. M. B. Newey.
 Temp. Qmr. and Capt. F. Richardson.
 Lieut.-Col. G. B. Riddick.
 Qmr. and Capt. (Temp. Major) H. Sprinks.
 Major (Acting Lieut.-Col.) G. H. Stevenson, D.S.O., M.B.
 Temp. Capt. J. R. Stott, M.B.
 Temp. Capt. E. R. Thompson, M.B.
 Capt. and Brevet Major (Acting Lieut.-Col.) P. S. Tomlinson.
 Temp. Capt. J. Warnock, M.D.
 Temp. Capt. L. T. Wells.
 Temp. Lieut.-Col. C. M. Wenyon, C.M.G., M.B.
 Temp. Capt. A. Wilkin.
 Temp. Capt. J. K. Willis, M.B.
 Temp. Major H. W. Wiltshire, D.S.O., M.D.
 Temp. Capt. (Acting Major) L. D. Woods.
 Temp. Capt. F. H. Young.
 2148 Serjt. (Acting Qmr.-Serjt.) J. Ashcroft.
 16447 Staff-Serjt. W. J. Ashworth.
 42112 Pte. E. J. Bell.
 43420 Serjt. J. Bonsall.
 94356 Pte. (Acting Lance-Serjt.) H. Bromhead.
 100816 Cpl. (Acting Serjt.) H. J. Brooks.
 63398 Pte. M. Brushby.
 22387 Pte. (Acting Cpl.) J. Buckley.
 33022 Pte. T. Burnett.
 89002 Serjt. E. Butterworth.
 96667 Pte. F. Cheeseman.
 82305 Pte. (Acting Serjt.) G. V. Churchman.
 59582 Staff-Serjt. H. A. Constable.
 24049 Pte. (Acting Cpl.) A. H. Crowle.

92735 Pte. M. Davies.
 81913 Pte. T. I. Davies.
 10611 Pte. (Acting Lance-Serjt.) J. Devine.
 49823 Staff-Serjt. (Acting Serjt.-Major) R. Dunn.
 46621 Pte. P. Fenton.
 119464 Pte. W. Ferrell.
 9389 Pte. H. G. Field.
 8306 Pte. (Acting Serjt.) F. Fowler.
 55006 Serjt. F. Foxall.
 37222 Serjt. W. Haiselden.
 12052 Staff-Serjt. (Temp. Serjt.-Major) F. C. Halkett.
 60286 Pte. (Acting Serjt.) J. A. C. Hampden.
 47840 Pte. J. Harrison.
 30179 Serjt.-Major L. McL. Hayes.
 39747 Cpl. (Acting Serjt.) S. Hogg.
 11287 Pte. (Acting Lance-Cpl.) T. H. Hollingworth.
 69487 Cpl. (Acting Lance-Serjt.) C. Howe.
 100609 Pte. A. Hunter.
 28769 Pte. J. W. Illingworth.
 874 Staff-Serjt. (Acting Serjt.-Major) F. A. Johnson.
 59956 Cpl. H. Jones.
 117042 Pte. J. Jones.
 110318 Cpl. (Acting Serjt.) O. E. L. Jones.
 78897 Serjt. J. J. Laurence.
 26766 Pte. G. B. Lee.
 15983 Temp. Serjt.-Major C. E. Lister.
 221 Cpl. (Acting Serjt.) G. J. Long.
 93733 Pte. J. Mackenzie.
 33376 Serjt.-Major A. J. Magee.
 89363 Pte. (Acting Cpl.) A. Marr.
 22129 Cpl. (Acting Lance-Serjt.) A. S. Marshall.
 6231 Serjt. (Temp. Serjt.-Major) P. J. Martin.
 53778 Cpl. W. Mayes.
 79188 Pte. M. McDowell.
 60031 Serjt. (Acting Staff-Serjt.) A. Miles.
 46435 Cpl. H. S. Morgan.
 32630 Pte. S. Moulton.
 70913 Pte. J. Murphy.
 26078 Cpl. A. H. Naish.
 105352 Pte. F. G. Orchard.
 93660 Serjt.-Major W. A. Paul.
 57448 Pte. (Acting Cpl.) W. Pizzie.
 37886 Serjt. A. Pomfret.
 904 Pte. (Acting-Serjt.) J. T. Reese.
 104945 Serjt. (Acting Staff-Serjt.) T. Rocum.
 89157 Pte. G. H. Rowse.
 85082 Pte. (Acting Cpl.) J. D. Rushton.
 19515 Staff-Serjt. G. D. Salter.
 286906 Staff-Serjt. F. J. Smith.
 92389 Qmr.-Serjt. (Acting Serjt.-Major) W. J. Smith.
 26028 Serjt.-Major W. V. H. Smith.
 55851 Pte. F. Standish.
 26020 Serjt.-Major A. Stead.
 42757 Cpl. W. A. Tither.
 495620 Pte. F. E. Upton.
 53015 Serjt. D. Wallace.
 28111 Pte. W. Wightman.
 19662 Pte. O. W. Woodward.
 24205 Serjt. S. C. Yeomans.
 23910 Pte. (Acting Cpl.) R. T. Young.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. A. La B. Clarke, M.B.
 Capt. G. Ewen, M.B.
 Capt. (Acting Major) J. W. P. Harkness, M.B.
 Capt. A. C. MacDonald.
 Capt. W. McElroy.

Capt. (Acting Major) O. J. O'B. O'Haulon, M.B., F.R.C.S.
 Capt. B. J. Byrie, M.B.
 Capt. J. H. Sewart.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Capt. J. A. Andrews, 2nd (London) Sanitary Company.
 Capt. H. A. T. Fairbank, D.S.O., F.R.C.S.
 Qmr. and Capt. B. Fairweather, 1/3rd (London) Field Ambulance.
 Capt. (Temp. Lieut.-Col.) A. W. Falconer, D.S.O., M.B., 1st Scottish General Hospital.
 Capt. C. E. Ferrey, 1st (London) Sanitary Company.
 Capt. (Temp. Lieut.-Col.) E. G. Gauntlett, D.S.O., M.B., F.R.C.S.
 Capt. T. S. Hele, M.D.
 Qmr. and Capt. J. Keogh, 3rd (H.C.) Field Ambulance (Died).
 Major (Temp. Lieut.-Col.) A. E. Kidd, M.B., 3rd (High) Field Ambulance.
 Qmr. and Capt. A. J. H. Knights, T.D., 1/2nd (London) Field Ambulance.
 Capt. (Acting Major) J. C. Marklove, 3rd (H.C.) Field Ambulance.
 Capt. and Brevet Major W. J. F. Mayne, M.B., 1st (London) Sanitary Company.
 Capt. (Temp. Major) R. P. Nash.
 Capt. (Temp. Lieut.-Col.) J. Patrick, M.B., F.R.C.S., 3rd Scottish General Hospital.
 Capt. (Acting Major) H. A. Playfair-Robertson, M.B., 1st (H.C.) Field Ambulance.
 Capt. J. T. M. H. Simson.
 Capt. (Acting Major) R. M. Vick.
 Major (Acting Lieut.-Col.) J. Ward, D.S.O., 1st (H.C.) Field Ambulance.
 Capt. J. Waterson, 1st (London) Sanitary Company.
 Capt. W. C. D. Wilson, 2/2nd (High) Field Ambulance.
 528280 Pte. (Acting Cpl.) J. Barringer, 1st (London) Sanitary Company.
 390289 Serjt. R. A. Bell, 2/3rd (Northumberland) Field Ambulance.
 527879 Lance-Cpl. (Acting Cpl.) W. Brace, 1st (London) Sanitary Company.
 545861 Serjt. (Acting Staff-Serjt.) F. R. Chalmers, 2nd (London) Sanitary Company.
 527651 Cpl. (Acting Serjt.) E. J. Cushion, 1st (London) Sanitary Company.
 527761 Serjt. (Acting Staff-Serjt.) H. V. Dixon, 1st (London) Sanitary Company.
 528275 Pte. (Acting Cpl.) T. Douglas, 1st (London) Sanitary Company.
 528050 Cpl. (Acting Serjt.) F. Frampton, 1st (London) Sanitary Company.
 527384 Lance-Cpl. (Acting Cpl.) W. W. S. Hall, 1st (London) Sanitary Company.
 527099 Pte. (Acting Serjt.) J. Handscombe, 1st (London) Sanitary Company.
 493007 Serjt. A. H. Holtum, 1st (H.C.) Field Ambulance.
 527108 Pte. (Acting Lance-Cpl.) A. J. Houlding, 1st (London) Sanitary Company.
 527252 Pte. (Acting Cpl.) Jack, 1st (London) Sanitary Company.
 305142 Serjt. W. Kinnear, 1/3rd (High) Field Ambulance.
 527127 Serjt. T. E. Lineker, 1st (London) Sanitary Company.
 527127 Pte. (Acting Lance-Cpl.) S. E. Monk, 1st (London) Sanitary Company.
 510131 Pte. F. Palmer, 1/2nd (London) Field Ambulance.
 510004 Staff-Serjt. A. Rayner, 1/2nd (London) Field Ambulance.
 564269 Pte. (Acting Serjt.) J. M. Russell, 2nd (London) Sanitary Company.
 497192 Pte. (Acting Cpl.) W. G. F. Searl, 2nd (H.C.) Field Ambulance.
 510248 Pte. E. G. Smith, 1/2nd (London) Field Ambulance.
 512166 Cpl. (Acting Serjt.) J. E. Wickens, 1/3rd (London) Field Ambulance.

MAJOR-GENERAL W. MALLESON'S FORCE.

Medical Department.

Temp. Lieut. Mohamed Nawaz, Indian Medical Service.
 75366 Acting Cpl. E. E. Bate, Royal Army Medical Corps.

War Office,

June 5, 1919.

The Secretary of State for War has received the following dispatch addressed to the Chief of the General Staff, India, by Lieutenant-General Sir W. R. Marshall, K.C.B., K.C.S.I., Commanding-in-Chief, Mesopotamian Expeditionary Force:—

**General Headquarters,
 Mesopotamian Expeditionary Force.**

February 7, 1919.

SIR,—With reference to paragraph 39 of my dispatch dated February 1, 1919, I have the honour to submit herewith a list of names of those Officers, Ladies, Warrant and Non-Commissioned Officers and Men serving or who have served under my command, whose distinguished and gallant devotion to duty I consider deserving of special mention:—

I have the honour to be, Sir,

Your obedient servant,

W. R. MARSHALL, *Lieut.-General,
 Commanding-in-Chief, Mesopotamian
 Expeditionary Force.*

Col. (Temp. Major-Gen.) A. P. Blenkinsop, C.B., C.M.G., Army Medical Service.
80938 Pte. (Acting-Serjt.) R. W. Boniface, Royal Army Medical Corps.

ARMY MEDICAL SERVICE.

Col. P. Evans, C.M.G., M.B.
Col. J. D. Ferguson, C.M.G., D.S.O.
Temp. Col. T. P. Legg, C.M.G., M.B., F.R.C.S.
Col. A. H. Morris.
Col. W. T. Mould.
Col. W. H. Starr, C.B., C.M.G.
Temp. Col. W. H. Willcox, C.B., C.M.G., M.D., F.R.C.P.

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. (Temp. Col.) J. H. R. Bond, D.S.O.
Temp. Capt. W. Brown.
Temp. Capt. T. P. Buist, M.B.
Lieut.-Col. (Temp. Col.) E. W. W. Cochrane, D.S.O., M.B.
Temp. Capt. W. MacC. Conley, M.B.
Major (Acting Lieut.-Col.) W. Davis, M.B.
Lieut. Col. G. G. Delap, C.M.G., D.S.O.
Capt. and Brevet Major L. Dunbar, M.B.
Capt. (Acting Lieut.-Col.) W. J. Dunn, M.B.
Lieut.-Col. J. G. Foster, M.B.
Lieut. (Temp. Capt.) O. D. Jarvis, M.B.
Temp. Capt. I. W. Jones, M.B.
Capt. (Acting Major) D. H. C. MacArthur, M.D.
Temp. Capt. A. MacMillan.
Capt. and Brevet Major W. MacNaughtan, M.B.
Temp. Capt. W. M. Menzies, M.B.
Capt. and Brevet Major T. J. Mitchell, D.S.O., M.B.
Temp. Qmr. and Lieut. J. S. Moore.
Lieut.-Col. (Temp. Col.) H. M. Morton, D.S.O., M.B.
Temp. Capt. S. Murray, M.B.
Major H. W. Russell, M.D.
Major (Acting Lieut.-Col.) A. W. Sampey.
Temp. Capt. A. F. Sanderson.
Temp. Major (Acting Lieut.-Col.) E. W. Skinner, M.D.
Lieut.-Col. and Brevet Col. J. M. Sloan, C.M.G., D.S.O., M.B.
Capt. (Acting Major) E. P. A. Smith, M.C., M.B.
Temp. Capt. C. R. Taylor, M.B.
Capt. R. R. Thompson, M.C.
Capt. (Acting Major) H. C. Todd, M.B.
Temp. Capt. A. Topping, M.B.
Temp. Qmr. and Lieut. G. B. Walker, M.C.
Major N. D. Walker, M.B.
Capt. J. M. Weddell.
Lieut.-Col. J. F. Whelan, D.S.O., M.B.
Temp. Capt. J. S. Young, M.D.
76205 Pte. (Acting Cpl.) S. C. Atkinson.
97905 Pte. (Acting Serjt.) H. M. Bennett.
28173 Cpl. (Acting Serjt.) R. T. G. Bradley.
88408 Pte. (Acting Serjt.) A. M. Brine.
27882 Pte. (Acting Lance-Cpl.) W. Browning.
97899 Pte. (Acting Serjt.) P. J. Cleary.
79850 Pte. (Acting Serjt.) E. J. Cooper.
79578 Serjt. J. Cumming.
105643 Pte. W. J. Greenhalgh.
53764 Cpl. (Acting Regt.-Serjt.-Major) C. Grice.
79315 Pte. (Acting Serjt.) H. R. Halkes.
9413 Pte. (Acting Serjt.) S. Hall, 21st Lancers, attached Royal Army Medical Corps.
39428 Serjt. (Acting Staff-Serjt.) A. T. Hawkes.
58901 Pte. (Acting Serjt.) R. H. Heaney.
12748 Pte. C. Homer.
14926 Serjt.-Major W. H. G. Hunt.
102810 Pte. C. Isherwood.
32621 Pte. (Acting Serjt.) A. Johnson.
83823 Pte. (Acting Serjt.) S. W. Longthorne.

77964 Pte. (Acting Cpl.) C. H. Marshall.
 29533 Cpl. (Acting Staff-Serjt.) F. J. H. Martin.
 77021 Pte. J. Middleton, 2nd (Garrison) Battalion, Northumberland Fusiliers, attached
 Royal Army Medical Corps.
 59763 Pte. (Acting Staff-Serjt.) W. Middleton.
 12506 Qmr.-Serjt. (Acting Regt.-Serjt.-Major) P. J. O'Rourke.
 83876 Pte. (Acting Serjt.) L. W. Oxley.
 25038 Serjt. H. Payne.
 28022 Serjt. (Acting Staff-Serjt.) D. Pugh.
 21872 Pte. (Acting Lance-Cpl.) J. L. Read.
 83506 Pte. (Acting Serjt.) A. C. Roberts.
 2 Serjt. N. Schokman, Ceylon, Sanitary Section, attached Royal Army Medical Corps
 249 Serjt. (Acting Staff-Serjt.) A. H. Scovell.
 77549 Pte. (Acting Company Qmr.-Serjt.) C. R. Spraggon.
 79025 Pte. F. Stephens.
 18170 Staff-Serjt. (Acting Regimental Serjt.-Major) L. Sufrin.
 97921 Cpl. (Acting Serjt.) G. P. Trasler.
 105907 Pte. O. Turner.
 78697 Pte. E. Vaughan.
 104458 Pte. (Acting Cpl.) W. Walton.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. J. W. W. Baillie, M.B.
 Capt. J. M. H. Campbell.
 Capt. (Acting Major) J. P. Charnock, M.B.
 Capt. W. Dunlop, O.B.E., M.B.
 Capt. H. L. Garson, M.C.
 Capt. R. W. Macdonald, M.B.
 Capt. K. B. MacGlashan, M.D., F.R.C.S. Edin.
 Capt. J. M. Morrison, M.B.
 Capt. J. B. Steven, M.B.
 Capt. (Acting Major) P. Thornton, M.C.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Capt. A. E. Bonham.
 Capt. T. A. Fisher.
 Lieut.-Col. F. E. Fremantle, M.B., F.R.C.S., F.R.C.P.
 Major (Acting Lieut.-Col.) R. Griffith.
 Capt. F. T. H. Wood, M.B.
 527370 Cpl. (Acting Serjt.) R. H. Carter, 1st (London) Sanitary Company.
 456127 Pte. (Acting Serjt.) C. E. Coey.
 505021 Staff-Serjt. A. Longstaff, 27th Sanitary Section.
 505029 Pte. (Acting Lance-Cpl.) G. T. Portus, 99th Sanitary Section.
 464037 Cpl. (Acting Staff-Serjt.) H. W. Rowsell, 101st Sanitary Section.
 456126 Pte. (Acting Serjt.) R. Sharp.

NORTH PERSIAN FORCE.

Royal Army Medical Corps.

Temp. Capt. H. G. Baynes, M.B.
 Capt. (Acting Lieut.-Col) E. T. Burke, D.S.O. (Special Reserve).
 Temp. Capt. W. A. L. Dunlop, M.B.
 Capt. (Temp. Major) O. H. Mayor, M.B. (Special Reserve).
 Capt. J. S. Sloper, M.B.
 Lieut.-Col. W. M. B. Sparkes, D.S.O.
 105484 Pte. (Acting Serjt.) J. F. Collinge.
 36555 Qmr.-Serjt. (Acting Company Serjt.-Major) H. J. Stark.

War Office,
 June 5, 1919.

The following dispatch has been received by the Secretary of State for War from
 Lieutenant-General Sir J. L. Van Deventer, K.C.B., C.M.G., Commanding-in-Chief, East
 African Force :—

Pretoria,
January 20, 1919.

SIR,—I have the honour to forward herewith my recommendations in favour of the undermentioned Officers, Ladies, Warrant Officers, Non-Commissioned Officers and Men for valuable services rendered during the period August 1, 1918, to the conclusion of hostilities.

I have the honour to be, Sir,
Your obedient servant,
J. L. VAN DEVENTER,
Lieutenant-General,
Commanding-in-Chief, East African Force.

June 5, 1919.

ROYAL ARMY MEDICAL CORPS.

Temp. Capt. W. D. Allan, M.B.
Temp. Capt. J. Brierley, M.D.
Temp. Capt. R. P. Garrow, M.B.
Temp. Major T. C. McKenzie, M.B.
Temp. Capt. N. S. Neill, M.B.
Temp. Capt. C. H. Shaw, M.B.
Temp. Capt. J. A. Struthers, M.B.
Temp. Capt. L. H. D. Thornton.
2034 Cpl. H. F. Beck.
57575 Serjt. R. Buxton.
9828 Staff-Serjt. C. G. Clarke.
43913 Serjt. J. Collier.
Serjt. A. Dawber.
79120 Serjt. D. G. Evans.
97378 Pte. A. C. Farrier.
68975 Serjt. E. A. Forbes.
83574 Serjt. I. N. Irving.
6273 Pte. H. A. H. Parnell.
10285 Pte. (Acting Lance-Cpl.) A. E. Rolston.
98412 Cpl. T. G. Seaward.
6414 Pte. W. L. Till.
63452 Pte. T. Williamson.
79475 Serjt. S. A. Wright.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. J. F. C. Braine.
Capt. F. J. C. Johnstone, M.B.
Capt. R. Lloyd-Jones.
Capt. G. L. Malcolm-Smith.
Capt. R. R. Scott, M.C.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

318345 Serjt. J. Mather.
322029 Qmr.-Serjt. W. McKewan.
475291 Pte. J. A. Priest.
545263 Serjt. C. N. Rowe.
545850 Cpl. (Acting Staff-Serjt.) F. Russell.
120089 Staff-Serjt. F. G. Waring.

War Office,
June 5, 1919.

The names of the undermentioned have been brought to the notice of the Secretary of State for War by Major-General W. E. Ironside, C.M.G., D.S.O., Commanding-in-Chief, Northern Russia Expeditionary Force, for valuable and distinguished services rendered in connexion with the operations at Archangel:—

Capt. (Acting Lieut.-Col.) D. C. L. Fitzwilliams, M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Capt. N. H. Harrison, Royal Army Medical Corps (Special Reserve).

Capt. A. Irvine-Fortescue, M.B., Royal Army Medical Corps.

44337 Qmr.-Serjt. A. S. Clarke, Royal Army Medical Corps.

339171 Cpl. (Acting Serjt.) D. W. Conway, Royal Army Medical Corps (Territorial Force).

13921 Staff-Serjt. (Acting Serjt.-Major) J. W. Cooper, Royal Army Medical Corps.

318203 Pte. (Acting Staff-Serjt.) W. B. Findlay, Royal Army Medical Corps.
 29074 Serjt. J. A. Hanman, Royal Army Medical Corps.
 27225 Qmr.-Serjt. (Temp. Serjt.-Major) W. Lee, Royal Army Medical Corps.
 4427 Cpl. (Acting Serjt.) A. H. Richards, Royal Army Medical Corps.
 545500 Cpl. (Acting Serjt.) O. A. Stunt, Royal Army Medical Corps (Territorial Force).
 417384 Pte (Acting Lance-Cpl.) J. S. Woodhouse, Royal Army Medical Corps.

War Office,
 June 5, 1919.

The names of the undermentioned have been brought to the notice of the Secretary of State for War by Major-General C. C. M. Maynard, C.B., C.M.G., D.S.O., Commanding-in-Chief, Allied Land Forces, Murmansk District, for valuable and distinguished services rendered in connexion with the operations at Murmansk :—

Capt. (Temp. Major) C. G. G. Keane, Royal Army Medical Corps.
 Temp. Capt. A. H. Macklin, M.C., M.B., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) G. Muir, Royal Army Medical Corps.
 Capt. (Temp. Lieut.-Col.) J. J. D. Roche, M.B., Royal Army Medical Corps.
 22613 Pte. Gardner, 86th General Hospital, Royal Army Medical Corps.
 129467 Pte. C. Grocey, Royal Army Medical Corps.
 51455 Pte (Acting Serjt.) F. Hines, 127th Sanitary Section, Royal Army Medical Corps.
 115535 Pte. H. W. Phillips, Royal Army Medical Corps.
 393001 Qmr.-Serjt. (Temp. Serjt.-Major) J. Tunnah, Royal Army Medical Corps.

War Office,
 June 5, 1919.

The following dispatch has been received by the Secretary of State for War from Major-General Sir L. O. FitzM. Stack, K.B.E., C.M.G., Acting Sirdar of the Egyptian Army and Acting Governor-General of the Sudan :—

Headquarters,
 Egyptian Army and Sudan Government,
 Khartoum.

January 26, 1919.

SIR,—I have the honour to forward herewith the names of Officers, officials and others whose work in connexion with military operations, and the situation in the Sudan created by the War, is deserving of special notice and commendation.

I have the honour to be, Sir,

Your obedient Servant,

LEE STACK, Major-General,
 Acting Sirdar of the Egyptian Army and
 Acting Governor-General of the Sudan.

NO. 1.—MILITARY OPERATIONS.

Lieut.-Col. F. F. Carroll, D.S.O., M.B., Royal Army Medical Corps.
 Major C. Cassidy, M.C., M.B., Royal Army Medical Corps.
 Capt. S. McK. Saunders, Royal Army Medical Corps.

NO. 2.—ADMINISTRATIVE SERVICES.

Major R. G. Archibald, D.S.O., M.B., Royal Army Medical Corps.
 Major D. S. B. Thomson, M.B., Royal Army Medical Corps.

War Office,
 June 7, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign :—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Croix de Guerre.

Temp. Capt. (Acting Major) Lewis Anderson, D.S.O., M.B., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) William Bennett, D.S.O., M.B., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Francis Lyndon Bradish, D.S.O., Royal Army Medical Corps.
 Capt. Robert Burgess, D.S.O., M.C., Royal Army Medical Corps (Territorial Force).
 Major George Garnet Greer, M.C., Canadian Army Medical Corps.
 Temp. Capt. (Acting Major) Trevor Abbott Lawder, Royal Army Medical Corps.
 Col. Vernon Prynn, D.S.O., F.R.C.S., Army Medical Service.

Capt. (Acting Major) Peter Hohn Ryan, M.C., M.B., Royal Army Medical Corps.
Col. Robert Percy Wright, C.M.G., D.S.O., Canadian Army Medical Corps.

Medaille Militaire.

26867 Serjt. Frederick Charles, 40th Field Ambulance, Royal Army Medical Corps (Leicester).

Medaille des Epidemies (en Vermeil).

545655 Cpl. Walter Henry Lewis, 1/2nd London Sanitary Company, Royal Army Medical Corps (Territorial Force) (Wembley, Middlesex).

Médaille des Epidemies (en Argent).

464002 Cpl. (Acting Serjt.) John Ackland, 1/1st Wessex Divisional Sanitary Section, Royal Army Medical Corps (Braunton, North Devon).

473201 Qmr.-Serjt. William John Leach, 2/1st (East Anglian) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Newmarket).

Medaille de l'Assistance Publique (en Argent).

Capt. John Kennedy Gaunt, M.B., Royal Army Medical Corps.

Temp. Capt. Vivian Gray-Maitland, Royal Army Medical Corps.

Temp. Capt. Allan Douglas Low, Royal Army Medical Corps.

Temp. Capt. Walter Justice Paramore, Royal Army Medical Corps.

Temp. Capt. Robert Thomson, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Joseph Hugh Ward, D.S.O., M.C., M.B., Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

Ordre de Leopold.

Commandeur Lieut.-Gen. Sir Thomas Herbert John Chapman Goodwin, K.C.B., C.M.G., D.S.O.

Officier Brevet-Col. Sir Edward Scott Worthington, Kt., K.C.V.O., C.M.G., Royal Army Medical Corps.

Order de la Couronne.

Officier Major (Acting Lieut.-Col.) Thomas Bettesworth Moriarty, D.S.O., Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.

Order of St. Sava, 5th Class.

Capt. Fleet Floyd Strother Smith, M.B., Indian Medical Service.

Silver Medal for Zealous Service.

105438 Pte. (Acting Cpl.) Stuart Harry Douglas George, Royal Army Medical Corps (Tufnell Park, N.).

Cross of Mercy.

Capt. (Temp. Lieut.-Col.) Sir Thomas Crisp English, K.C.M.G., M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force), attached Royal Army Medical Corps.

23208 Pte. Joseph Norman Greaves, Royal Army Medical Corps (North Seaton).

60069 Pte. George Smith, Royal Army Medical Corps (Pilsley, Chesterfield).

War Office,

June 19, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS PRESENTED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Croix de Guerre.

Col. John Donald Alexander, D.S.O., M.B.

Brevet Lieut.-Col. (Temp. Lieut.-Col.) Elliott Beverly Bird, D.S.O., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Arthur Joseph Blake, M.C., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Arthur William Stark Christie, M.B., F.R.C.S., Royal Army Medical Corps.

Brevet Col. (Temp. Col.) Henry Edward Manning Douglas, V.C., C.M.G., D.S.O., Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) William Ross Gardner, D.S.O., M.B., Royal Army Medical Corps (Special Reserve).

Capt. Charles Frederick Hacker, M.C., M.B., Army Medical Corps.

Col. Wilfrid Edward Hudleston, C.M.G., D.S.O.

Capt. William John Knight, M.C., M.D., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) Langford Newman Lloyd, C.M.G., D.S.O., Royal Army Medical Corps.

Qmr. and Capt. Harry Miller, Royal Army Medical Corps.

Temp. Capt. James Carter Ogilvie, M.C., M.B., Royal Army Medical Corps, attached Border Regiment.

Major (Acting Lieut.-Col.) Donald de Courcey O'Grady, Royal Army Medical Corps.

Qmr. and Lieut. William Wilfred Parnell, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Edward Phillips, M.C., M.B., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) Horace Sampson Roch, C.M.G., D.S.O., Royal Army Medical Corps.

Temp. Capt. (Acting Lieut.-Col.) Lawrence Drew Shaw, D.S.O., M.B., Royal Army Medical Corps.

Capt. (Acting Major) John Rollo Noel Warburton, M.C., Royal Army Medical Service (Special Reserve).

41261 Serjt. Alexander Syson Bell, 108th Field Ambulance, Royal Army Medical Corps (Belfast).

22437 Pte. Sydney Horace Cox, 98th Field Ambulance, Royal Army Medical Corps (Enfield).

301239 Pte. Gordon Cruickshank, M.M., Royal Army Medical Corps, 89th Highland Field Ambulance (Territorial Force) (Aberdeen).

81270 Lance-Cpl. Cecil Franks, 97th Field Ambulance, Royal Army Medical Corps (Blidworth).

35272 Pte. William Gray, 105th Field Ambulance, Royal Army Medical Corps.

350290 Cpl. (Acting Serjt.) Albert Holden, 2/1st Field Ambulance (East Lanes.) Territorial Force, Royal Army Medical Corps (Bolton, Lanes.).

69063 Serjt. John Harry Jones, 95th Field Ambulance, Royal Army Medical Corps (Wrexham).

66936 Pte. Percy Llewellyn, 139th Field Ambulance, Royal Army Medical Corps (Birmingham).

65765 Pte. (Acting Lance-Serjt.) James Peat, 102nd Field Ambulance, Royal Army Medical Corps (Epsom).

38368 Serjt.-Major Ellis Ratchliffe, D.C.M., 138th Field Ambulance, Royal Army Medical Corps (Lees, near Keighley).

66919 Cpl. (Acting Serjt.) Ernest Albert Snelling, 140th Field Ambulance, Royal Army Medical Corps (Torquay).

528078 Pte. (Acting Cpl.) Selwyn Stott, 1st London Sanitary Company, Royal Army Medical Corps (Territorial Force) (Halifax).

30147 Qmr.-Serjt. (Acting Serjt.-Major) Charles Sumners, 106th Field Ambulance, Royal Army Medical Corps (Horndean).

400108 Serjt. Charles Reginald Tattersall, 43rd Field Ambulance, Royal Army Medical Corps (Territorial Force) (Driffild, East Yorkshire).

31089 Pte. John Richard West, 42nd Field Ambulance, Royal Army Medical Corps (Filgrave).

31816 Serjt. (Acting Qmr.-Serjt.) Bernard Wilson, 29th Field Ambulance, Royal Army Medical Corps (Cottingham).

July 3, 1919.

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for bravery in the Field to the undermentioned Warrant Officers, Non-Commissioned Officers and Men:—

ROYAL ARMY MEDICAL CORPS.

104301 Pte. D. G. Coomber, 101st Field Ambulance (Worthing) (Egypt).

32315 Pte. R. A. Gibbs, 30th Field Ambulance (Langrish) (Egypt).

CANADIAN FORCE.

530506 Pte. W. S. Anthliff, No. 9 Field Ambulance, Canadian Army Medical Corps.

536065 Pte. T. Armitstead, 13th Field Ambulance, Canadian Army Medical Corps.

26669 Cpl. W. E. Baker, No. 1 Field Ambulance, Canadian Army Medical Corps.

530099 Pte. H. J. Black, No. 8 Field Ambulance, Canadian Army Medical Corps.

522769 Pte. J. E. Bowden, 8th Field Ambulance, Canadian Army Medical Corps.

529520 Lance-Serjt. J. T. Bowie, 10th Field Ambulance, Canadian Army Medical Corps.

529534 Cpl. W. Cairnie, 10th Field Ambulance, Canadian Army Medical Corps.

- 33307 Serjt. W. J. Campbell, 3rd Field Ambulance, Canadian Army Medical Corps.
 529533 Staff-Serjt. G. F. Carter, 10th Field Ambulance, Canadian Army Medical Corps.
 524660 Pte. L. F. Celle, 13th Field Ambulance, Canadian Army Medical Corps.
 530104 Cpl. F. E. Clements, 8th Field Ambulance, Canadian Army Medical Corps.
 530108 Pte. A. M. Creighton, 8th Field Ambulance, Canadian Army Medical Corps.
 524873 Pte. T. E. Dalton, 5th Field Ambulance, Canadian Army Medical Corps.
 532152 Staff-Serjt. G. C. G. Dodds, 12th Field Ambulance, Canadian Army Medical Corps.
 33322 Staff-Serjt. J. H. Dyer, Canadian Army Medical Corps.
 50568 Pte. G. H. Ford, 8th Field Ambulance, Canadian Army Medical Corps.
 521060 Pte. J. A. Fraser, 1st Field Ambulance, Canadian Army Medical Corps.
 524929 Pte. S. Fulton, 9th Field Ambulance, Canadian Army Medical Corps.
 530541 Lance-Cpl. C. A. Godfrey, 9th Field Ambulance, Canadian Army Medical Corps.
 523613 Pte. R. P. Grimes, 10th Field Ambulance, Canadian Army Medical Corps.
 529576 Serjt. H. Hall, 10th Field Ambulance, Canadian Army Medical Corps.
 1250517 Pte. G. A. Hamilton, 6th Field Ambulance, Canadian Army Medical Corps.
 1311 Cpl. G. W. Hogarth, 4th Field Ambulance, Canadian Army Medical Corps.
 530088 Serjt. A. C. Holding, 4th Battalion, Canadian Army Medical Corps.
 529066 Pte. H. A. Holmes, 9th Field Ambulance, Canadian Army Medical Corps.
 2024 Cpl. R. Inniss, 6th Field Ambulance, Canadian Army Medical Corps.
 524551 Pte. J. Keech, 8th Field Ambulance, Canadian Army Medical Corps.
 1331 Pte. E. Livingstone, 4th Field Ambulance, Canadian Army Medical Corps.
 530050 Pte. H. W. Lovell, 8th Field Ambulance, Canadian Army Medical Corps.
 210829 Pte. F. Lowe, 4th Field Ambulance, Canadian Army Medical Corps.
 700526 Pte. S. G. Lowes, 12th Field Ambulance, Canadian Army Medical Corps.
 524558 Pte. G. F. MacKenzie, 9th Field Ambulance, Canadian Army Medical Corps.
 530580 Pte. D. MacKinnon, 9th Field Ambulance, Canadian Army Medical Corps.
 529614 Serjt. J. McAndrew, 10th Field Ambulance, Canadian Army Medical Corps.
 530581 Pte. L. G. McLanchlin, 9th Field Ambulance, Canadian Army Medical Corps.
 530137 Cpl. W. S. Maguire, 8th Field Ambulance, Canadian Army Medical Corps.
 33405 Serjt. T. Main, 2nd Field Ambulance, Canadian Army Medical Corps.
 530687 Pte. J. Matthews, 9th Field Ambulance, Canadian Army Medical Corps.
 529602 Serjt. M. A. Millar, 10th Field Ambulance, Canadian Army Medical Corps.
 522883 Cpl. R. T. Millner, 3rd Field Ambulance, Canadian Army Medical Corps.
 1366 Lance-Cpl. W. M. Morris, 4th Field Ambulance, Canadian Army Medical Corps.
 1371 Pte. A. W. Neal, 4th Field Ambulance, Canadian Army Medical Corps.
 155070 Lance-Cpl. J. Ogilvie, 9th Field Ambulance, Canadian Army Medical Corps.
 53069 Lance-Serjt. G. Patience, 8th Field Ambulance, Canadian Army Medical Corps.
 529060 Pte. R. R. Penhale, 9th Field Ambulance, Canadian Army Medical Corps.
 535475 Pte. C. S. Reid, 9th Field Ambulance, Canadian Army Medical Corps.
 400455 Serjt. H. Sawyer, 9th Field Ambulance, Canadian Army Medical Corps.
 475324 Pte. R. B. Simms, 10th Field Ambulance, Canadian Army Medical Corps.
 524587 Pte. J. Spurge, 8th Field Ambulance, Canadian Army Medical Corps.
 228219 Pte. T. S. Staton, 1st Field Ambulance, Canadian Army Medical Corps.
 2132 Lance-Cpl. T. Swift, 6th Field Ambulance, Canadian Army Medical Corps.
 86535 Cpl. R. Taylor, 10th Field Ambulance, Canadian Army Medical Corps.
 1733 Pte. A. Turner, 10th Field Ambulance, Canadian Army Medical Corps.
 32908 Pte. W. Waring, 1st Field Ambulance, Canadian Army Medical Corps.
 530691 Pte. A. J. Waterman, 9th Field Ambulance, Canadian Army Medical Corps.
 529054 Pte. H. Woolnough, 8th Field Ambulance, Canadian Army Medical Corps.

AUSTRALIAN IMPERIAL FORCE.

- 3865 Lance-Serjt. E. Thorpe, 4th L.H. Field Ambulance, Australian Army Medical Corps (Egypt).
 2830 Pte. W. P. Whittlesea, 3rd L.H. Field Ambulance, Australian Army Medical Corps (Egypt).

SOUTH AFRICAN FORCE.

- 891 Cpl. G. Paterson, 3rd Field Ambulance, South African Army Medical Corps (East Africa).

AMENDMENTS.

The following are the correct descriptions of the undermentioned Warrant Officers, Non-commissioned Officers and Men whose names have recently appeared in the *London Gazette* for the award of the Military and Meritorious Service Medal:—

Military Medal.

465037 Cpl. J. P. Green, 4th Field Ambulance, Royal Army Medical Corps. (Gazetted as Carnell.)

Meritorious Service Medal.

(*London Gazette*, dated December 17, 1917.)

40449 Serjt.-Major A. E. Blagrove, Royal Army Medical Corps. (Gazetted as Blaygrove.)

War Office,
July 12, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE UNITED STATES OF AMERICA.

The American Distinguished Service Medal.

Major-Gen. (Temp. Lieut.-Gen.) Sir Charles Henry Burtchaell, K.C.B., C.M.G., M.B., K.H.S.

War Office,
July 14, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Légion d'Honneur.

Officier Major-Gen. Menus William O'Keefe, K.C.M.G., C.B., M.D.

Croix de Guerre.

Major-Gen. Harry Neville Thompson, C.B., C.M.G., D.S.O., M.B.

Croix de Guerre avec Etoile en Vermeil.

301239 Pte. Gordon Cruickshank, 89th Field Ambulance, Royal Army Medical Corps (Aberdeen).

Médaille Militaire.

83767 Regimental Serjt.-Major Thomas William Comfort, Royal Army Medical Corps (Kingston-on-Thames).

7296 Serjt. William Alfred Percival, 8th Field Ambulance, Royal Army Medical Corps (North Kensington).

Médaille d'Honneur avec Glaives en Vermeil.

36588 Serjt.-Major Thomas Simpson, 34th Field Ambulance, Royal Army Medical Corps (Stourbridge).

Médaille d'Honneur avec Glaives en Argent.

31860 Serjt. Gustavus Frankel, 8th Field Ambulance, Royal Army Medical Corps (Spitalfields, E.).

58655 Cpl. (Acting Serjt.) Frank Turner, Royal Army Medical Corps (Whitby).

33415 Pte. Alfred George Burke, 35th Field Ambulance, Royal Army Medical Corps (Sheffield).

72639 Serjt. Harold Arthur Christian, Royal Army Medical Corps (Great Yarmouth).

71738 Lance-Cpl. Thomas Hacking, 137th Field Ambulance, Royal Army Medical Corps (East Manchester).

1/01951 Pte. William Kay, 23rd Field Ambulance, Royal Army Medical Corps (Darwen, Lancs.).

90328 Pte. George Mackenzie, Royal Army Medical Corps (Wick).

545165 Pte. William Newman, 2nd London Sanitary Company, Royal Army Medical Corps (Streatham).

75228 Pte. Richard Wilkinson Turnbull, 73rd Field Ambulance, Royal Army Medical Corps (Usworth).
 53207 Pte. Ernest Frederick Gordon Wallace, Royal Army Medical Corps (Chichester).

War Office,
 July 15, 1919.

His Majesty the King has been graciously pleased to approve of the following immediate awards for conspicuous gallantry and devotion to duty in North Russia, conferred by Major-Gen. C. C. M. Maynard, C.B., C.M.G., D.S.O., in pursuance of the powers vested in him by His Majesty:—

AWARDED A BAR TO THE MILITARY CROSS.

Capt. Frederick George Flood, M.C., M.B., Royal Army Medical Corps (Special Reserve).

During operations at Vigezere and Petrovaki Yam, on March 18, 1919, he dressed wounded under heavy machine-gun and rifle fire, and under most trying conditions saved many lives. After the action he successfully evacuated all the wounded over sixty versts of most difficult country without losing a case. He showed great gallantry and marked ability and devotion to duty. (M.C. gazetted June 18, 1917.)

**AMENDMENT TO THE *London Gazette*, DATED JANUARY 1, 1919.
 K.C.B.**

Page 81. For Major-Gen. George Joseph Hamilton Evatt, C.B., M.D., read Major-Gen. George Joseph Hamilton Evatt, C.B., M.D. (Hon. Col., Home Counties Division, Royal Army Medical Corps, Territorial Force), retired pay, Army Medical Service.

AMENDMENT TO SUPPLEMENT TO *London Gazette*, DATED JUNE 9, 1919.

(*To be Lieut.-Colonel.*)

Page 7009. For Qmr. and Major H. Wooley, Royal Army Medical Corps, read Qmr. and Major H. Woolley, Royal Army Medical Corps.

July 15, 1919.

CORRECTIONS.

The following are the correct descriptions of Officers whose names appeared in the *Gazettes* indicated, in connexion with the grant of decorations or Mentions in *Dispatches*:—

Capt. James Henry Cooke, M.B.E., M.B. (Royal Army Medical Corps, Egypt) (*Gazette* No. 31098, January 1, 1919).

ARMY MEDICAL SERVICE.

Col. S. Guise Moores, C.B., C.M.G., relinquishes the temporary rank of Major-Gen. on ceasing to be employed as D.M.S. of an Army, dated April 10, 1919.

Col. Sir W. H. Horrocks, K.C.M.G., C.B., M.B., retired pay, to be Temp. Dir. of Hygiene at the War Office, and to be Temp. Brig.-Gen. whilst so employed, dated June 1, 1919.

Lieut.-Col. D. Harvey, C.M.G., C.B.E., M.D., Royal Army Medical Corps, to be Deputy Director of Pathology at the War Office, and to be Temp. Col. whilst so employed, dated June 1, 1919.

Temp. Lieut. Charles Alexander Whitfield, M.C., to be Lieut., dated September 5, 1918, but not to reckon for pay or allowances prior to May 1, 1919, with precedence next below J. C. Coutts.

Major Phillip C. T. Davy, C.M.G., is seconded for serving under the Egyptian Government, dated May 1, 1919.

Major and Brevet Lieut.-Col. W. C. Smales, D.S.O., Royal Army Medical Corps, from Deputy Assistant Director-General, to be Assistant Director of Hygiene at the War Office, dated June 1, 1919.

Major-Gen. Sir W. B. Leishman, K.C.M.G., C.B., F.R.S., M.B., F.R.C.P., F.R.F.P.S., K.H.P., to be Director of Pathology at the War Office, dated June 1, 1919.

Major A. C. H. Gray, O.B.E., M.B., Royal Army Medical Corps, to be Assistant Director of Pathology at the War Office, and to be Temp. Lieut.-Col. whilst so employed, dated June 10, 1919.

Major and Brevet Lieut.-Col. W. C. Smales, D.S.O., Royal Army Medical Corps, from Deputy Assistant Director-General, to be Assistant Director of Hygiene at the War Office, and to be Temp. Lieut.-Col. whilst so employed, Dated June 1, 1919. (Substituted for the notification in the *Gazette* of June 30, 1919.)

Capt. Henry Bryan Frost Dixon, M.C., M.B., from Royal Army Medical Corps (Territorial Force), to be Captain, dated February 5, 1918, but not to reckon for pay or allowances prior to May 1, 1919, with precedence next below R. E. Barnsley.

Capt. S. S. Dykes, M.B., to be Acting Major whilst commanding troops on a Hospital Ship, from September 11, 1918 to April 24, 1919.

Capt. (Acting Major) G. G. Collet to draw the pay and allowances of his acting rank from November 20, 1918, to March 25, 1919, when he relinquishes the acting rank of Major.

Capt. H. F. Joynt, M.B., March 22, 1919.

Capt. (Acting Major) A. G. Wells, D.S.O., relinquishes the acting rank of Lieut.-Col., dated April 11, 1919, and is granted the acting rank of Major.

Capt. L. G. Bourdillon, D.S.O., M.C., is seconded for service with the Egyptian Army, dated April 24, 1919.

Capt. H. H. Leeson, M.C., on ceasing to command a Field Ambulance relinquish the acting rank of Lieut.-Col., dated June 12, 1919.

Major L. V. Thurston, D.S.O., on ceasing to command a Medical Unit relinquish the acting rank of Lieut.-Col., dated June 23, 1919.

Capt. (Acting Major) R. B. Phillippo to draw the pay and allowances of his acting rank from April 28, 1919.

Capt. (Acting Major) W. W. Treves, M.B., F.R.C.S., retires, receiving a gratuity, dated June 19, 1919, and is granted the rank of Major.

The notification regarding Capt. E. Catford, in the *Gazette* of January 31, 1919, is cancelled.

The notification regarding Major G. De la Cour, M.B., in the *Gazette* of March 22, 1919, is cancelled.

The notification regarding the appointment of Charles Henry Thorne as Qmr. and Hon. Lieut. in the *Gazette* of April 5, 1919, is cancelled.

The notification in the *Gazette* of April 26, 1917, regarding Lieut.-Col. F. F. Carroll, D.S.O., is cancelled.

The notification in the *Gazette* of May 9, 1919, regarding Capt. (Acting Lieut.-Col.) E. T. Burke, D.S.O., M.B., is cancelled, dated June 5, 1919.

The notification in the *Gazette* of May 9, 1919, regarding Capt. Donald McIntyre, M.B.E., M.B., is cancelled, dated July 19, 1919.

The notification of the relinquishment of the acting rank of Lieut.-Col. by Major P. T. C. Davy, C.M.G., in the *Gazette* of June 12, 1919, is cancelled.

The undermentioned to be seconded for service under the Civil Administration of Mesopotamia :—

Dated April 1, 1919.—Capt. and Brevet Major A. G. J. MacIlwaine, C.I.E.; Capt. and Brevet Major L. Dunbar; Capt. T. J. Halliman; Capt. P. A. With; Capt. O. D. Jarvis, M.B.

The undermentioned Colonels retire on retired pay :—

Dated May 22, 1919.—Col. Richard Hugh Penton, D.S.O.

Dated June 1 1919.—Frederick James Morgan, C.M.G.; Robert Lockhart Ross Macleod, C.B., M.B.; Nicholas Charles Ferguson, C.M.G.

Dated June 15, 1919.—Col. Sydney G. Allen.

Dated June 21, 1919.—Col. Frederick J. Morgan, C.M.G.

Dated June 28, 1919.—Col. James Fallon.

Dated July 7, 1919.—Col. Thomas Du B. Whaite, C.B., C.M.G.

The undermentioned Lieutenant-Colonels retire on retired pay :—

Dated April 27, 1919.—Lieut.-Col. George Arthur Theodore Bray, D.S.O.

Dated June 21, 1919.—Lieut.-Col. George E. F. Stammers, O.B.E.

Dated July 9, 1919.—Lieut.-Col. Septimus H. Fairrie, M.B.

The undermentioned relinquish the acting rank of Colonel on reposting :—

Dated December 24, 1918.—Lieut.-Col. Fitz G. G. FitzGerald, D.S.O.

Dated February 28, 1919.—Capt. and Brevet Major W. G. Wright, D.S.O.

Dated March 13, 1919.—Major C. Bramhall; Major W. Egan, D.S.O., M.B.

Dated March 16, 1919.—Major J. J. O'Keeffe; Major R. N. Woodley, D.S.O.

Dated March 17, 1919.—Lieut.-Col. H. M. Morton, D.S.O., M.B.; Capt. W. J. Dunn, M.B.

Dated March 18, 1919.—Capt. J. W. C. Stubbs, M.C., M.B.; Capt. H. G. Monteith, D.S.O.

Dated March 19, 1919.—Capt. E. W. Vaughan, M.C., M.B.; Major and Brevet Lieut.-Col. J. G. Bell, D.S.O., M.B.; Major T. E. Harty, D.S.O.

Dated March 20, 1919.—Major J. M. M. Crawford, F.R.C.S.I.

Dated March 22, 1919.—Lieut.-Col. and Brevet Col. R. S. Hannay, C.M.G., D.S.O.

Dated March 26, 1919.—Lieut.-Col. H. G. Martin, C.M.G.

Dated March 27, 1919.—Capt. R. B. Price, D.S.O., M.B.

Dated —March 30, 1919.—Capt. F. Worthington, D.S.O., O.B.E., M.B.

- Dated March 31, 1919.—Capt. E. Phillips, M.C., M.B.; Capt. R. Hemphill, D.S.O., M.B.
 Dated April 1, 1919.—Major E. C. Phelan, D.S.O., M.C., M.B.; Capt. C. Helm, D.S.O., M.C.
 Dated April 4, 1919.—Major and Brevet Lieut.-Col. C. W. Holden, D.S.O. (Substituted for the notification regarding this officer in the *Gazette* of June 5, 1919.)
 Dated April 7, 1919.—Capt. F. C. Davidson, M.C., M.B.
 Dated April 12, 1919.—Capt. J. H. Fletcher, D.S.O., M.C.
 Dated April 13, 1919.—Major D. P. Watson, D.S.O., M.B.
 Dated April 14, 1919.—Lieut.-Col. F. McLennan, D.S.O., M.B.
 Dated April 15, 1919.—Capt. J. D. Bowie, D.S.O., M.B.; Capt. and Brevet Major F. T. Dowling, M.B.
 Dated April 18, 1919.—Capt. C. M. Drew, M.B.
 Dated April 19, 1919.—Lieut.-Col. H. C. R. Hime, D.S.O., M.B.
 Dated April 20, 1919.—Capt. H. C. D. Rankin, M.B.
 Dated April 22, 1919.—Major G. F. Rudkin, D.S.O.
 Dated April 23, 1919.—Major B. Johnson, D.S.O., M.B.; Major T. Henry Scott, D.S.O., M.C., M.B.
 Dated May 13, 1919.—Major C. G. Thomson, D.S.O.
 Dated May 20, 1919.—Capt. L. F. K. Way.
 Dated June 6, 1919.—Major T. S. Blackwell.
 The undermentioned relinquish the acting rank of Lieut.-Colonel on reposting :—
 Dated July 10, 1918.—Major P. C. T. Davy, C.M.G., M.B.
 Dated October 17, 1918.—Major R. C. Wilson, M.B.
 Dated February 28, 1919.—Capt. R. R. Thompson, M.C.
 Dated March 1, 1919.—Capt. T. A. Weston, M.B.
 Dated March 3, 1919.—Major W. C. Nimmo; Major W. J. Wateers.
 Dated March 4, 1919.—Major D. L. Harding, D.S.O., F.R.C.S.I.
 Dated March 12, 1919.—Capt. and Brevet Major J. A. Manifold, D.S.O., M.B.; Major W. J. Weston, D.S.O.; Major H. H. A. Emerson, D.S.O., M.B.
 Dated March 22, 1919.—Major R. E. U. Newman, M.C., M.B.
 Dated April 11, 1919.—Major R. F. M. Fawcett, D.S.O.
 Dated April 13, 1919.—Capt. H. A. Harbison, M.C., M.B.
 Dated April 19, 1919.—Capt. C. Clarke, D.S.O., M.B.; Capt. G. P. Taylor, D.S.O., M.C., M.B.
 Dated April 24, 1919.—Major E. M. O'Neill, D.S.O., M.B.
 Dated April 25, 1919.—Capt. J. R. Hill, M.B.
 Dated April 30, 1919.—Major Phillip C. T. Davy, C.M.G.
 Dated May 11, 1919.—Capt. G. F. Allison.
 Dated May 14, 1919.—Major C. T. Edmunds, D.S.O.; Capt. F. R. Laing, M.B.
 Dated May 26, 1919.—Capt. A. J. Hickey, M.C.
 Dated June 2, 1919.—Major W. W. Boyce, D.S.O.
 The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel on ceasing to be specially employed :—
 Dated March 17, 1919.—E. W. W. Cochrane, D.S.O., M.B.
 Dated April 12, 1919.—L. N. Lloyd, C.M.G., D.S.O.
 The undermentioned to be Acting Colonels whilst specially employed :—
 Dated April 11, 1919.—Lieut.-Col. J. A. Hartigan, C.M.G., D.S.O., M.B.
 Dated June 1, 1919.—Lieut.-Col. Sydney G. Butler, D.S.O.
 The undermentioned relinquish the temporary rank of Lieutenant-Colonel on reposting :—
 Dated April 3, 1919.—Major and Brevet Lieut.-Col. J. A. Anderson, M.B.
 Dated May 21, 1919.—Major F. C. Sampson, D.S.O., M.B.
 Dated June 10, 1919.—Major and Brevet Lieut.-Col. M. G. Winder, D.S.O.
 The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel on reposting :—
 Dated April 8, 1919.—F. J. Brakenridge, C.M.G.
 Dated April 14, 1919.—J. S. Gallie, C.M.G., D.S.O.; G. J. Houghton, D.S.O.
 Dated May 5, 1919.—H. E. M. Douglas, V.C., C.M.G., D.S.O.
 Dated May 8, 1919.—W. Bennett, D.S.O., M.B.
 The undermentioned relinquish the acting rank of Lieutenant-Colonel on reposting :—
 Dated April 4, 1919.—Major and Brevet Lieut.-Col. C. W. Holden, D.S.O.
 The undermentioned relinquish the acting rank of Lieutenant-Colonel on ceasing to be specially employed :—
 Dated May 25, 1919.—Major J. E. Carter, M.B.
 Dated June 27, 1919.—Major A. E. S. Irvine, D.S.O.
 The undermentioned to be Acting Lieutenant-Colonels whilst specially employed :—
 Dated March 29, 1919.—Major and Brevet Lieut.-Col. W. Benson, D.S.O., M.B.

Dated April 14, 1919.—Major W. J. Weston, D.S.O.
 Dated April 19, 1919.—Major E. C. Phelan, D.S.O., M.C., M.B.
 Dated April 23, 1919.—Major R. B. Hole, M.B.
 Dated April 29, 1919.—Major E. B. Booth, D.S.O., M.D.
 Dated June 1, 1919.—Capt. R. M. Dickson, M.D.
 Dated June 8, 1919.—Major E. E. Parkes, M.B.

The undermentioned to be Acting Lieutenant-Colonels whilst commanding Medical Units:—

Dated October 14, 1918.—Major R. N. Hunt, D.S.O., M.B., to be Acting Lieut.-Col. whilst commanding a Medical Unit. (Substituted for the notification regarding this officer in the *Gazette* of May 27, 1919.)

Dated October 18, 1918.—Capt. (Acting Major) T. A. Weston, M.B.

Dated December 29, 1918.—Capt. (Acting Major) W. W. MacNaught, M.C., M.B.

Dated January 31 to April 21, 1919.—Major J. A. W. Webster.

Dated February 21, 1919.—Major N. E. Dunkerton, D.S.O.

Dated April 4, 1919.—Major and Brevet Lieut.-Col. C. W. Holden, D.S.O.

Dated June 21, 1919.—Major E. M. O'Neill, D.S.O., M.B.; Major A. M. Rose, D.S.O., M.B.

The undermentioned Lieutenants (Temporary Captains) to be Captains:—

Dated May 1, 1919.—W. H. A. D. Sutton.

Dated May 5, 1919.—W. D. Newland, M.C.

Dated May 8, 1919.—L. S. C. Roche, M.C.

Dated May 14, 1919.—C. L. Emmerson.

Dated May 16, 1919.—F. A. R. Hacker.

Dated June 1, 1919.—G. D. Gripper.

Dated June 23, 1919.—G. T. Baker, M.C.

Dated June 28, 1919.—(Acting Major) H. C. Watson, M.C., M.B., and retains his acting rank.

Dated June 29, 1919.—G. T. Gimlitte, M.B.

Dated June 29, 1919.—G. T. Gimlette, M.B.

The undermentioned to be Acting Majors whilst specially employed:—

Dated January 20, 1919.—Capt. W. J. Tobin.

Dated March 19, 1919.—Capt. E. G. S. Cane.

Dated June 1, 1919.—Capt. N. V. Lothian, M.C., M.B.

Dated June 13, 1919.—E. A. Strachan, M.B.

The undermentioned relinquish the acting rank of Major on reposting:—

Dated March 3, 1919.—Capt. R. A. Mansell, M.B.E., M.B.

Dated March 24, 1919.—Capt. J. K. Gaunt, M.B.

Dated April 11, 1919.—Capt. W. V. Corbett.

Dated April 17, 1919.—Capt. J. la F. Lauder, D.S.O., M.C.

Dated May 1, 1919.—Capt. J. Vallance, M.B.

The undermentioned to be Acting Majors:—

Dated October 31, 1918.—Capt. A. E. Richmond.

Dated January 8, 1919.—Capt. T. J. L. Thompson, M.C., M.B.

Dated April 7, 1919.—Capt. K. P. Mackenzie, M.B.

Dated April 20, 1919.—Capt. A. L. Foster.

Dated April 22, 1919.—Capt. C. E. L. Harding.

Dated June 1, 1919.—Capt. and Brevet Major J. D. Kidd, M.C., M.B.

Dated June 14, 1918.—Capt. W. T. Graham, M.B.

The undermentioned relinquish the acting rank of Major:—

Dated November 8, 1918.—Capt. and Brevet Major S. W. Kyle, M.B.

Dated February 8, 1919.—Capt. F. R. S. Shaw, M.C., M.B.

Dated February 24, 1919.—Capt. D. H. C. McArthur, M.D.; Capt. A. L. Stevenson, M.B.

Dated February 26, 1919.—Capt. and Brevet Major A. Shepherd, M.B.

Dated March 4, 1919.—Capt. R. H. Williams.

Dated March 5, 1919.—Capt. J. H. Baird; Capt. T. K. Boney, M.D.

Dated March 6, 1919.—Capt. A. P. O'Connor, M.C., M.B.

Dated March 11, 1919.—Capt. W. J. Knight, M.C., M.D.

Dated March 16, 1919.—Capt. R. C. Aitchison, M.B.

Dated March 17, 1919.—Capt. E. G. H. Cowen, M.B.

Dated March 18, 1919.—Capt. R. W. Vint, M.B.

Dated March 19, 1919.—Capt. A. L. Stevenson, M.B.

Dated March 20, 1919.—Capt. C. Russell, M.C., M.B.

Dated March 28, 1919.—(Temp. Capt.) G. E. Spicer, M.C.

Dated March 30, 1919.—Capt. G. P. Kidd, D.S.O., M.C.; Capt. F. C. Chandler, M.C., M.B.

Dated March 31, 1919.—Capt. T. D. Inch, O.B.E., M.C., M.B.

The undermentioned relinquish the acting rank of Major :—

Dated April 3, 1919.—Capt. T. J. L. Thompson, M.C., M.B.

Dated April 5, 1919.—Capt. and Brevet Major F. C. Cowtan; Capt. J. A. Renshaw.

Dated April 6, 1919.—Capt. and Brevet Major W. L. Webster, M.B.

Dated April 10, 1919.—Capt. E. A. Hepple, M.C., M.B.

Dated April 12, 1919.—Capt. E. B. Marsh, M.C., M.B.; Capt. R. Ellis, M.C., M.B.

Dated April 17, 1919.—Capt. N. Cantlie, M.C., M.B.

Dated May 18, 1919.—Capt. C. M. Rigby.

Dated May 26, 1919.—Capt. F. R. H. Mollan.

Dated June 12, 1919.—Capt. C. T. V. Benson.

The undermentioned Captains resign their commands :—

Dated June 6th, 1919.—Capt. C. J. O'Reilly, M.C., M.D.

Dated June 11, 1919.—Capt. A. L. Urquhart, O.B.E., M.B.

Dated June 12, 1919.—Capt. T. D. Inch, O.B.E., M.C., M.B.; Capt. C. J. D. May.

Dated June 19, 1919.—Capt. J. E. Rusby, M.C.

Dated July 1, 1919.—Capt. J. A. Andrews, M.C., M.B.; Capt. J. A. W. Ebden, M.B.

Dated July 18, 1919.—Capt. H. A. Harbison, M.C., M.B.

The undermentioned to be Lieutenants, and to be Temporary Captains, but not to reckon for pay or allowances prior to June 1, 1919, with precedence as stated :—

Dated May 22, 1916.—Temp. Capt. Herbert John Davidson, M.C., M.B., next below P. G. Russell.

Dated October 2, 1916.—Capt. Gerald Hugh Barry, M.B., from Special Reserve, next below G. G. Drummond.

Dated January 1, 1917.—Capt. Thomas Stanton, M.B., from Special Reserve, next below J. P. Macnamara.

Dated June 1, 1917.—Temp. Capt. Thomas Hill Twigg, M.B., next below J. M. Morrison.

The undermentioned to be Lieutenants and to be Temporary Captains, but not to reckon for pay or allowances prior to July 1, 1919, with precedence as stated :—

Dated February 4, 1916.—Temp. Capt. Charles Hugh Colclough Byrne, next below T. C. Bowie.

Dated August 25, 1916.—Temp. Capt. Arthur James Bado, next below B. J. Daunt.

Dated July 5, 1917.—Capt. Pat Adam Stewart, M.B., from Special Reserve, next below K. Masson.

Dated July 26, 1917.—Temp. Capt. George William Bernard Shaw, M.B., next below J. C. Collins.

Dated April 8, 1918.—Capt. Malcolm Clark Paterson, M.C., M.B., from Special Reserve, next below G. E. MacAlevey.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to May 1, 1919, with precedence as stated :—

Dated January 19, 1919.—Capt. (Acting Major) Charles Henry Brennan, M.C., from Special Reserve, next below A. J. Beveridge, and to retain his acting rank.

Dated February 27, 1918.—Temp. Capt. William Frier, M.B., next below R. W. Galloway.

Dated June 4, 1918.—Temp. Capt. Michael Patrick Power, M.C., next below W. E. Adam.

Dated February 6, 1918.—Capt. Sarsfield James Ambrose Hall Walshe, D.S.O., M.B., from Special Reserve, next below R. E. Barnsley; Capt. William Walker, M.C., M.B., from Special Reserve, next below R. J. Clausen.

Dated February 25, 1919.—Temp. Capt. Andrew William Palethorpe Todd, M.C., M.B., next below J. E. Rusby.

Dated March 19, 1918.—Capt. (Acting Major) George Allman Bridge, M.C., M.B., from Special Reserve, next below W. E. Tyndall, and to retain his acting rank.

Dated March 23, 1918.—Capt. Frank Sheppard Gillespie, M.B., from Special Reserve, next below H. G. Trayer.

Dated March 30, 1918.—Capt. (Acting Major) Joseph Andrew Lowther Wilson, M.B., from Special Reserve, next below W. W. McNaught, and to retain his acting rank.

Dated May 1, 1918.—Temp. Capt. Daniel McKelvey, M.C., M.B., next below T. F. Kennedy.

Dated May 11, 1918.—Capt. Bertrand Cecil Owens Sheridan, M.C., M.B., from Special Reserve, next below K. A. M. Tomory.

The undermentioned Temporary Captains to be Lieutenants and to be Temporary Captains, but not to reckon for pay or allowances prior to May 1, 1919, with precedence as stated :—

Dated December 28, 1915.—(Acting Major) Henry Currie Watson, M.C., M.B., next below G. T. Baker, and to retain his acting rank.

Dated September 1, 1916.—Ailwyn Herbert Clarke, M.C., M.B., next below B. J. Daunt.
 Dated November 1, 1917.—Thomas Bousfield Herrick Tabuteau, next below A. R. Barlas.
 The undermentioned Captains, from Special Reserve, to be Lieutenants and to be Temporary Captains, but not to reckon for pay or allowances prior to May 1, 1919, with precedence as stated :—

Dated August 28, 1916.—Hugh Moore Alexander, next below B. J. Daunt.

Dated November 1, 1917.—(Acting Major) Douglas James Valentine, next below A. R. Barlas, and to retain his acting rank.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to June 1, 1919, with precedence as stated :—

Dated February 10, 1918.—Temp. Capt. Cecil Beresford Hogg, M.B., next below L. G. Bourdillon.

Dated March 16, 1918.—Temp. Capt. Ernest Edwin Holden, next below A. C. Jebb.

Dated March 20, 1918.—Temp. Capt. William Moodie, M.D., next below D. W. John.

Dated June 16, 1918.—Temp. Capt. Alexander Mearns, M.B., next below F. J. Hallinan.

Dated July 15, 1918.—Capt. (Acting Major) Hugh Arthur Sandiford, M.C., M.B., from Territorial Force, next below F. Harris, and retains his acting rank.

Dated August 10, 1918.—Temp. Capt. Frank Hamersley Woods, next below C. R. Dudgeon.

Dated September 24, 1918.—Temp. Capt. Francis Albert L'Estrange, M.B., next below A. W. Raymond.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to July 1, 1919, with precedence as stated :—

Dated March 30, 1918.—Capt. William Hern Cornelius, from Special Reserve, next below C. de W. Gibb.

Dated June 2, 1918.—Temp. Capt. Reginald Hutchinson Lucas, M.C., next below W. E. Adam.

Dated September 19, 1918.—Temp. Capt. Patrick Joseph Standish O'Grady, next below G. H. Haines.

At the Edinburgh University Graduation Ceremonial on July 10, the honorary degree of Doctor of Laws of the University was conferred on Major-Gen. Sir W. G. Macpherson, K.O.M.G., C.B.

OBITUARY.

CAPTAIN WILLIAM S. R. STEVEN, R.A.M.C.

CAPT. WILLIAM S. R. STEVEN, R.A.M.C., who died on July 1, 1919, at the Military Hospital, Devonport, was the youngest son of the late John Steven, of Bay View, Sligo, Ireland, and grandson of the late Capt. Caleb Robertson, 88th (Connaught Rangers), of Abbey View, Boyle, Ireland. A student of Queen's College, Belfast, he took the degrees of M.B., B.Ch., R.U.I. in 1909. After acting as Resident Clinical Assistant at the Townsend Street Maternity Hospital, Belfast, and as a Resident Surgeon and Physician at the Royal Victoria Hospital, Belfast, he entered the Royal Army Medical Corps as Lieutenant in January, 1911. He was appointed to the Eastern Command and eventually proceeded to India early in 1913, being employed as malarial expert at Karachi. He was gazetted to the rank of Captain in July, 1914.

For the first eighteen months of the late war he acted, with great credit to himself, as Radiologist to the Colaba War Hospital, Bombay; later he was employed in a similar capacity on a hospital ship plying between East Africa, Mesopotamia and India, for a period of close on two years.

He was invalided from India at the beginning of the present year, and was at the time of his death, which was due to appendicitis, commanding the Military Hospital, Eggbuchland, Plymouth.

The late Captain Steven was a man of charming personality, conspicuous ability, and the possessor of many friends, by whom his loss is greatly deplored. He was unmarried.

By his untimely death at the age of 34, the Royal Army Medical Corps loses the services of one of its most promising officers.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

Major, willing to exchange to go abroad this trooping season. Bottom of foreign service roster April, 1915. Write, stating terms, to "O.C.," 36 C.C.S., British Army of the Rhine.

Lieut.-Colonel R.A.M.C., regular, now in India, four years to complete foreign tour, desires exchange with regular Officer at home. Apply "B.S.W.," c/o "Journal of the R.A.M.C.," 8, Serle Street, W.C.2.

FOR SALE.

R.A.M.C. Officer's full kit, made June, 1914, scarcely worn. Includes military frock coat, parade uniform, mess kit, helmet, &c., steel uniform and helmet cases, canvas kit bag, also mufti dress-suit, opera and silk hats. May be seen at T. W. Castle, Military Tailor, 27, Savile Row, W., who will undertake alterations.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

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Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 324, Adastral House, Victoria Embankment, E.C. 4.

Communications have been received from Major W. Broughton-Alcock; Captain E. P. Wheeler.

The following publications have been received:—

British: The Journal of the Royal Army Service Corps, The Journal of State Medicine, Journal of the Royal United Service Institution of India, The Indian Medical Gazette, The Medical Journal of Australia, The Hospital, Agricultural Research Institute, Pasa, Transactions of the Society of Tropical Medicine and Hygiene, The Medical Press, St. Bartholomew's Hospital Journal, The Journal of Tropical Medicine and Hygiene, The British Journal of Tuberculosis, Guy's Hospital Gazette, Tropical Diseases Bulletin, The Royal Engineers' Journal, The Middlesex Hospital Journal, Journal of the Royal Naval Medical Service, Edinburgh Medical Journal, The St. Thomas's Hospital Gazette, The Medical Review, Abstracts of Bacteriology, Tropical Veterinary Bulletin, The Practitioner, The British Journal of Surgery, The Quarterly Journal of Medicine, The Outlook.

Foreign: Archives Medicales Belges, United States Public Health Service, L'Ospedale Maggiore, Office International d'Hygiène Publique, The Military Surgeon, Rivista de la Sanidad Militar, United States Department of Agriculture, Bulletin of the Johns Hopkins Hospital, Bulletin d, l'Institut Pasteur, Colonies et Marine, United States Naval Medical Bulletin, Giornale di Medicina Militare, The Journal of Infectious Diseases, Surgery, Gynecology and Obstetrics, Archives de l'Institut Pasteur de Treves, Le Caducée, Archives de Médecine et Pharmacie Navales, Norsk Tidsskrift for Militar Medicin.

MANAGER'S NOTICES.

The **JOURNAL OF THE ROYAL ARMY MEDICAL CORPS** is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," 25, Adastral House, Victoria Embankment, E.C. 4, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co." and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

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JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

SEPTEMBER, 1919.

EXTRACTS FROM THE LONDON GAZETTE.

War Office,
July 10, 1919.

The following is a continuation of Sir D. Haig's dispatch of March 16, 1919, submitting names deserving of special mention :—

ARMY MEDICAL SERVICE.

- Col. J. D. Alexander, D.S.O., M.B.
Capt. (Acting Major) T. H. Balfour, M.B., Royal Army Medical Corps.
Col. F. W. Begbie.
Lieut.-Col. (Temp. Col.) W. Bennett, D.S.O., M.B., Royal Army Medical Corps.
Temp. Capt. (Acting Major) W. S. S. Berry, M.B., Royal Army Medical Corps.
Col. W. W. O. Beveridge, C.B., D.S.O., M.B.
Col. R. J. Blackham, C.M.G., C.I.E., D.S.O., M.D., F.F.P.S.
Lieut.-Col. (Acting Col.) W. R. Blackwell, C.M.G.
Capt. (Acting Major) H. E. A. Boldero, Royal Army Medical Corps.
Capt. and Brevet Major (Acting Major) L. G. Bourdillon, D.S.O., M.C., Royal Army Medical Corps.
Lieut.-Col. (Temp. Col.) A. W. N. Bowen, D.S.O., Royal Army Medical Corps.
Lieut.-Col. and Brevet Col. F. J. Brackenridge, C.M.G., Royal Army Medical Corps.
Col. H. A. Bray, C.M.G.
Temp. Capt. (Acting Major) L. R. Broster, M.B., Royal Army Medical Corps.
Major and Brevet Lieut.-Col. C. G. Browne, D.S.O., Royal Army Medical Corps.
Lieut.-Col. (Temp. Col.) B. B. Burke, D.S.O., Royal Army Medical Corps.
Major-Gen. (Temp. Lieut.-Gen.) C. H. Burtchaell, K.C.B., C.M.G., M.B., K.H.S.
Lieut.-Col. (Temp. Col.) J. H. Campbell, D.S.O., Royal Army Medical Corps.
Major-Gen. H. Carr, C.B., M.D.
Col. J. Clay, M.B., F.R.C.S., Territorial Force.
Lieut.-Col. (Acting Col.) H. Collinson, C.M.G., D.S.O., M.B., Royal Army Medical Corps (Territorial Force).
Major D. M. Corbett, M.B., Royal Army Medical Corps.
Capt. (Acting Major) W. V. Corbett, Royal Army Medical Corps.
Capt. (Acting Major) J. Dale, M.B., Royal Army Medical Corps (Territorial Force)
Lieut.-Col. B. R. Dennis, O.B.E., M.B., Royal Army Medical Corps.
Lieut.-Col. (Acting Col.) T. F. Dewar, C.B., T.D., M.D., Royal Army Medical Corps (Territorial Force).
Capt. (Acting Major) R. F. Dickinson, O.T., M.B., Royal Army Medical Corps.
Lieut.-Col. and Brevet Col. (Temp. Col.) H. E. M. Douglas, V.C., C.M.G., D.S.O., Royal Army Medical Corps.
Capt. (Acting Major) C. R. Dudgeon, M.C., Royal Army Medical Corps.
Col. H. N. Dunn, C.M.G., D.S.O., M.B.

- Major J. S. Dunne, D.S.O., F.R.C.S.I., Royal Army Medical Corps.
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 Lieut.-Col. (Temp. Col.) H. B. Fawcus, C.M.G., D.S.O., M.B., Royal Army Medical Corps.
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 Col. R. H. Firth, C.B., F.R.C.S.
 Lieut.-Col. (Acting Col.) Fitz-G. G. Fitz-Gerald, D.S.O., Royal Army Medical Corps.
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 Col. W. E. Hudleston, C.M.G., D.S.O.
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 Lieut.-Col. (Temp. Col.) D. O. Hyde, D.S.O., M.B., Royal Army Medical Corps.
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 Lieut. (Temp. Capt. and Acting Major) M. B. King, M.C., M.B., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) C. Kingston, Royal Army Medical Corps.
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 Lieut.-Col. (Temp. Col.) E. McDonnell, D.S.O., M.B., Royal Army Medical Corps.
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Major M. B. H. Ritchie, D.S.O., M.B., Royal Army Medical Corps.

Capt. (Acting Major) A. L. Robertson, M.B., Royal Army Medical Corps.

Capt. (Acting Major) W. H. Rowell, M.D., Royal Army Medical Corps (Territorial Force).

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Lieut.-Col. (Temp. Col.) A. H. Safford, Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) J. P. Silver, D.S.O., M.B., Royal Army Medical Corps.

Temp. Capt. (Acting Major) G. W. Smith, M.B., Royal Army Medical Corps.

Lieut.-Col. S. B. Smith, D.S.O., M.D., Royal Army Medical Corps.

Col. J. C. B. Statham, C.M.G.

Lieut.-Col. G. N. Stephen, Royal Army Medical Corps.

Capt. (Acting Major) A. D. Stirling, D.S.O., M.B., Royal Army Medical Corps.

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Major-Gen. J. Thomson, C.B., M.B.

Col. H. S. Thurston, C.B., C.M.G.

Capt. (Acting Major) L. R. Tosswill, Royal Army Medical Corps (Territorial Force).

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Capt. (Acting Major) R. L. Ritchie, M.B., Royal Army Medical Corps.

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Temp. Major-Gen. Sir J. R. Bradford, K.C.M.G., C.B., M.D., F.R.C.S. (Major, Royal Army Medical Corps, Territorial Force).

Temp. Col. W. P. S. Branson, M.D., F.R.C.P.

Col. H. A. Bruce, F.R.C.S.

Temp. Lieut.-Col. H. Burrows, O.B.E., M.B., F.R.C.S. (Capt. (Acting Major), Royal Army Medical Corps, Territorial Force).

Temp. Lieut.-Col. R. H. Cooper.

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Temp. Capt. (Acting Lieut.-Col.) F. Fraser, F.R.C.S.

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Temp. Major-Gen. Sir W. P. Herringham, C.B., M.D. (Lieut.-Col., Royal Army Medical Corps, Territorial Force).

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Temp. Col. C. H. Miller, M.D., F.R.C.P.

Temp. Col. W. Pasteur, C.M.G., M.D., F.R.C.S. (Lieut.-Col., Royal Army Medical Corps, Territorial Force).

Col. E. M. Pilcher, C.B., D.S.O., M.B., F.R.C.S., K.H.S.

Lieut.-Col. W. Thorburn, C.B., M.D., F.R.C.S.

Temp. Major-Gen. C. S. Wallace, C.B., C.M.G.

Temp. Col. A. E. Webb-Johnson, D.S.O., M.B., F.R.C.S. (Capt., Royal Army Medical Corps, Territorial Force).

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Major (Acting Lieut.-Col.) R. B. Ainsworth, D.S.O.

Temp. Capt. (Acting Major) R. C. Alexander, M.B., F.R.C.S.

Temp. Capt. F. J. Allen, M.C., M.B.

- Temp. Capt. T. S. Allen, Lahore Indian Hospital.
 Capt. (Acting Major) W. B. Allen, V.C., D.S.O., M.C., M.B., attached 1/3rd (West Riding) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Major A. C. Amy, D.S.O., M.D., attached 2/1st (High) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) J. R. Anderson, M.B.
 Temp. Capt. W. Anderson, M.B., F.R.C.S.
 Temp. Capt. (Acting Major) W. B. G. Angus, M.C., M.B.
 Qmr. and Temp. Lieut. T. Armitage, 57th Field Ambulance.
 Lieut.-Col. M. H. Babington, D.S.O., Commanding 2nd General Hospital.
 Temp. Capt. L. W. Bain, M.C., M.B., 138th Field Ambulance.
 Major J. H. Barbour, M.B.
 Qmr. and Capt. A. P. Barnard.
 Temp. Capt. E. F. Bashford, M.D.
 Lieut.-Col. (Temp. Col.) H. R. Bateman, D.S.O.
 Qmr. and Capt. (Temp. Major) D. C. Baxter.
 Qmr. and Temp. Capt. S. T. Beard, 77th Field Ambulance.
 Temp. Capt. (Acting Major) F. G. Bell, M.C., M.D., F.R.C.S., 48th Casualty Clearing Station.
 Qmr. and Major G. A. Benson, D.C.M. (Hon. Capt., Reserve of Officers, Retired Pay).
 Temp. Capt. G. W. Beresford, F.R.C.S., 8th General Hospital.
 Capt. A. W. Bevis.
 Capt. (Acting Lieut.-Col.) F. E. Bissell, M.D., 58th Field Ambulance.
 Temp. Capt. G. W. Bissett, M.D.
 Temp. Capt. (Acting Major) P. L. Blaber, attached 26th (Wessex) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Major R. B. Black, D.S.O., M.B. (Reserve of Officers).
 Temp. Capt. E. W. Blake, 18th Casualty Clearing Station.
 Capt. and Brevet Major (Acting Lieut.-Col.) H. H. Blake, M.D.
 Temp. Capt. V. H. Blake, M.B.
 Capt. (Acting Lieut.-Col.) J. D. Bowie, D.S.O., M.B., 33rd Field Ambulance.
 Temp. Capt. C. E. Boyce, 83rd General Hospital.
 Major (Acting Lieut.-Col.) W. W. Boyce, D.S.O., 2nd Field Ambulance.
 Qmr. and Capt. G. T. Bray.
 Qmr. and Capt. W. Brennan, 49th Casualty Clearing Station.
 Temp. Capt. A. B. Brook, M.B., attached 1. 1st Battalion, Hereford Regiment (Territorial Force).
 Temp. Major R. W. Bruce, M.D., F.R.C.S., 136th Field Ambulance.
 Major (Acting Lieut.-Col.) J. C. G. Carmichael, M.B., 29th Casualty Clearing Station.
 Major (Acting Lieut.-Col.) W. J. C. Bell, D.S.O., M.B., 111th Field Ambulance.
 Qmr. and Capt. G. W. Carnell, 3rd General Hospital.
 Temp. Capt. (Acting Major) A. M. Caverhill, 52nd Field Ambulance.
 Capt. (Acting Lieut.-Col.) C. Clarke, D.S.O., M.B., F.R.C.S.
 Temp. Capt. (Acting Major) G. Clarke, M.D.
 Temp. Capt. H. E. Clutterbuck, M.D., F.R.C.S.
 Major (Acting Lieut.-Col.) T. S. Coates, O.B.E., M.B.
 Capt. (Temp. Major) F. E. Collard.
 Temp. Capt. (Acting Major) J. R. Collins, M.D., 30th General Hospital.
 Temp. Capt. C. G. Colyer.
 Temp. Capt. (Acting Major) J. D. Cooke, M.B., F.R.C.S.
 Temp. Capt. (Acting Major) R. C. Cooke, D.S.O., M.C., 134th Field Ambulance.
 Col. R. J. Copeland, M.B.
 Temp. Capt. W. J. Corbett, F.R.C.S.I., 83rd General Hospital.
 Temp. Capt. C. C. C. Court, M.B., 1st Cavalry Field Ambulance.
 Temp. Capt. J. Coutts, M.B., 14th General Hospital.
 Temp. Hon. Major E. G. Crabtree.
 Major and Brevet Lieut.-Col. (Acting Lieut.-Col.) B. A. Craig.
 Temp. Capt. J. G. Craig, M.B., F.R.C.S., 6th Stationary Hospital.
 Temp. Capt. W. Craig, M.B., 50th Field Ambulance.
 Major (Acting Lieut.-Col.) J. M. M. Crawford, F.R.C.S., 15th Casualty Clearing Station.
 Temp. Qmr. and Capt. T. A. Crichton, 52nd Field Ambulance.
 Temp. Hon. Major B. Crothers.
 Temp. Capt. J. Cruickshank, M.D.
 Temp. Capt. A. J. W. Cunningham, M.D.
 Major J. F. Cunningham, 83rd General Hospital.
 Temp. Capt. W. B. Dalgleish, 5th Casualty Clearing Station.
 Temp. Qmr. and Lieut. G. J. Darke, 19th Field Ambulance.

Temp. Capt. (Acting Lieut.-Col.) H. S. Davidson, M.B., F.R.C.S., 109th Field Ambulance.

Temp. Capt. H. R. Davies, M.D., 61st Casualty Clearing Station.

Capt. (Acting Lieut.-Col.) R. M. Davies, M.B., 34th Field Ambulance.

Temp. Capt. S. T. Davies, 12th Casualty Clearing Station.

Temp. Capt. G. de H. Dawson, M.C.

Temp. Capt. (Acting Major) W. Deane, 72nd General Hospital.

Major (Acting Lieut.-Col.) G. De la Cour, M.B., 4th Casualty Clearing Station.

Temp. Capt. A. W. Dennis, M.B., 10th Casualty Clearing Station.

Temp. Capt. E. R. Dermer, attached 5th Battalion, Royal Berks Regiment.

Temp. Capt. R. S. Dobbin, M.D.

Temp. Capt. (Acting Major) A. W. H. Donaldson, M.B., 18th Casualty Clearing Station.

Lieut.-Col. C. G. Douglas, M.C., M.D.

Major J. H. Douglass, M.D.

Major (Acting Lieut.-Col.) C. M. Drew, M.B., 134th Field Ambulance.

Temp. Hon. Lieut.-Col. G. Dreyer, attached Royal Air Force.

Temp. Capt. J. D. Driberg, M.C., F.R.C.S.

Qmr. and Capt. C. Drury, 20th Field Ambulance.

Temp. Capt. C. E. Dukes, M.B., 3rd Casualty Clearing Station.

Temp. Capt. (Acting Major) J. G. Duncanson, M.B., 72nd General Hospital.

Temp. Capt. E. C. Dutton, M.B., F.R.C.S., attached 51st Labour Group, Labour Corps.

Qmr. and Capt. (Temp. Major) E. Edser.

Temp. Capt. H. H. Elliot, M.C., M.B., 24th Field Ambulance.

Major (Acting Lieut.-Col.) A. C. Elliott, M.B., 3rd Cavalry Field Ambulance.

Temp. Capt. C. M. G. Elliott, attached Tank Corps.

Capt. (Acting Major) R. Ellis, M.C., M.B., 5th Field Ambulance.

Major (Acting Lieut.-Col.) H. H. A. Emerson, D.S.O., 44th Casualty Clearing Station.

Lieut.-Col. and Brevet Col. (Temp. Col.) H. Ensor, C.M.G., D.S.O., M.B.

Qmr. and Capt. (Temp. Major) E. W. J. Escott.

Lieut.-Col. (Acting Col.) C. R. Evans, D.S.O.

Temp. Capt. M. du B. Ferguson, M.D.

Major (Acting Lieut.-Col.) E. G. Ffrench, M.D., F.R.C.S.

Qmr. and Capt. C. A. Figg, 59th Casualty Clearing Station.

Temp. Capt. G. Fildes, M.B., 4th Mobile X-Ray Unit.

Qmr. and Capt. F. J. Filmer.

Temp. Hon. Capt. E. S. Fish.

Temp. Capt. A. Fleming, M.B., F.R.C.S.

Capt. (Acting Lieut.-Col.) J. H. Fletcher, D.S.O., M.C., Commanding 36th Field Ambulance.

Major (Acting Lieut.-Col.) A. D. Fraser, D.S.O., M.C., M.B., 9th Field Ambulance.

Temp. Capt. J. E. Frere, M.B., 39th Casualty Clearing Station.

Temp. Capt. T. F. S. Fulton, M.B., 9th Mobile Hygienic Laboratory.

Temp. Capt. (Acting Major) H. W. Gabe, F.R.C.S., 56th Casualty Clearing Station.

Capt. (Acting Lieut.-Col.) R. W. Galloway, M.B., 2nd Cavalry Field Ambulance.

Temp. Capt. G. C. Gell, 54th Field Ambulance.

Temp. Capt. (Acting Major) W. E. Gemmell, M.B.

Capt. (Acting Major) C. de W. Gibb.

Capt. and Brevet Major H. G. Gibson.

Temp. Capt. E. C. Girling, M.D., 19th Casualty Clearing Station.

Temp. Capt. S. R. Glead, attached 2/3rd (S. Mid.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) H. Goodman, 76th Field Ambulance.

Lieut.-Col. (Acting Col.) W. R. P. Goodwin, D.S.O.

Temp. Qmr. and Capt. W. Gough, 99th Field Ambulance.

Temp. Capt. C. B. Goulden, M.D., F.R.C.S.

Major (Acting Lieut.-Col.) A. C. H. Gray, M.B., 19th Casualty Clearing Station.

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Temp. Major K. E. L. G. Gunn, 83rd General Hospital.

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Temp. Capt. T. H. Harker, M.D., 10th Field Ambulance.

Temp. Capt. D. T. Harris, M.B., attached Headquarters, 29th Brigade, Royal Field Artillery.

Temp. Capt. J. N. J. Hartley, M.B., F.R.C.S.

Major (Acting Lieut.-Col.) W. J. S. Harvey, D.S.O., 36th Casualty Clearing Station.

Temp. Capt. T. A. Hawkesworth, M.B.

Lieut.-Col. E. C. Hayes, Commanding 47th General Hospital.

Temp. Capt. E. D. F. Hayes, M.B., attached 1st Battalion, Northumberland Regiment.

Major (Acting Lieut.-Col.) A. F. Heaton (Reserve of Officers).

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 Temp. Capt. W. Herbertson, M.B.
 Temp. Capt. E. Hesterlow, M.B., attached 16th Battalion, Lancashire Fusiliers.
 Temp. Capt. (Acting Major) T. T. Higgins, M.B., F.R.C.S., 2nd Stationary Hospital.
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 Temp. Qmr. and Capt. C. W. Hook, 42nd Field Ambulance.
 Temp. Capt. A. N. Hooper.
 Temp. Hon. Major C. W. M. Hope.
 Temp. Capt. E. L. Horsburg, M.D., 30th General Hospital.
 Temp. Hon. Major T. Houston, M.D.
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 Temp. Capt. C. W. W. James, attached Royal Air Force.
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 Temp. Qmr. and Capt. R. G. Johnston, attached 1/2nd (High) Field Ambulance, Royal Army Medical Corps (Territorial Force).
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 Qmr. and Capt. L. Jones, 31st Advanced Depot Medical Stores.
 Temp. Capt. (Acting Major) A. C. Keep, M.C., M.D., attached 1st D.A.C., Royal Field Artillery.
 Temp. Hon. Major R. F. Kennedy.
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 Temp. Capt. C. King, M.B., 3rd Casualty Clearing Station.
 Temp. Major C. F. Knight, D.S.O., M.B., 133rd Field Ambulance.
 Temp. Hon. Major L. F. Knuthsen, M.D.
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 Qmr. and Capt. H. B. Lee, 51st Field Ambulance.
 Capt. (Acting Lieut.-Col.) H. H. Leeson, M.C., 77th Field Ambulance.
 Temp. Capt. T. P. Lewis.
 Temp. Capt. (Acting Major) S. J. L. Lindeman, M.C.
 Temp. Capt. (Acting Major) E. C. Lindsay, M.B., F.R.C.S., 32nd Stationary Hospital.
 Temp. Capt. W. S. Lindsay, M.B.
 Temp. Capt. P. C. Litchfield, M.C., 15th Motor Ambulance Convoy.
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 Temp. Capt. (Acting Major) A. L. Lockwood, D.S.O., M.C., M.D.
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 Temp. Capt. W. MacEwen, M.B.
 Temp. Capt. (Acting Major) R. B. Macfie, M.B., F.R.C.S., 55th Casualty Clearing Station.
 Temp. Qmr. and Capt. J. B. Mackay, 92nd Field Ambulance.
 Temp. Capt. (Acting Major) C. Mackenzie, F.R.C.S., 14th General Hospital.
 Major (Acting Lieut.-Col.) D. F. Mackenzie, D.S.O., M.D., 59th Field Ambulance.
 Temp. Capt. D. Mackinnon, M.B., attached Headquarters, 282nd Army Brigade, Royal Field Artillery.
 Temp. Capt. J. W. Macleod, O.B.E., M.B.
 Temp. Capt. A. S. L. Malcolm, attached 1/1st (E. Ang.) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. E. C. Malden.
 Temp. Capt. A. C. Mann, M.C., M.B., attached 8th Battalion, South Wales Borderers.
 Temp. Capt. (Acting Major) F. B. Manser, M.B., 43rd Casualty Clearing Station.
 Major (Acting Lieut.-Col.) P. J. Marett.
 Temp. Capt. O. de B. Marsh, M.B.
 Temp. Capt. R. P. Marshall.
 Temp. Capt. (Acting Major) W. S. Martin, M.C., M.B.

Temp. Capt. (Acting Major) R. Massie, F.R.C.S., 47th General Hospital.
 Temp. Capt. H. N. Matthews, 63rd Field Ambulance.
 Temp. Capt. O. S. Maunsell.
 Capt. (Acting Major) C. A. R. McCay, 90th Field Ambulance.
 Qmr. and Capt. (Temp. Major) T. E. McColgin.
 Temp. Lieut. T. McLaren, M.B., 132nd Field Ambulance.
 Temp. Capt. G. McLeod, M.C., M.B.
 Temp. Capt. D. McNeill, M.B., 23rd Ambulance Train.
 Temp. Capt. J. P. McVey, M.C., attached 9th Battalion, Norfolk Regiment.
 Major A. A. Meaden, D.S.O.
 Lieut.-Col. T. I. N. Mears, D.S.O.
 Temp. Capt. C. H. Medlock, attached Tank Corps.
 Temp. Capt. A. U. Millar, M.C., M.B., attached 1/3rd (N. Mid.) Field Ambulance,
 Royal Army Medical Corps (Territorial Force).
 Temp. Capt. H. C. D. Miller, M.B., attached 5th (London) Field Ambulance, Royal
 Army Medical Corps (Territorial Force).
 Temp. Capt. E. T. C. Milligan, M.D.
 Temp. Capt. J. H. Moir, D.S.O., M.C., M.D., attached 17th Battalion, Royal Fusiliers.
 Capt. (Acting Lieut.-Col.) H. G. Monteith, D.S.O., 47th Field Ambulance.
 Capt. A. T. Moon, F.R.C.S., 4th Cavalry Field Ambulance.
 Major E. H. M. Moore, D.S.O., 1st (U.S.A.) General Hospital.
 Capt. (Acting Major) J. Y. Moore, 1st Cavalry Field Ambulance.
 Temp. Capt. R. F. Moore, F.R.C.S.
 Major (Acting Lieut.-Col.) C. R. M. Morris, D.S.O., M.B., 99th Field Ambulance.
 Temp. Capt. (Acting Major) J. Morrison, M.B., 20th Casualty Clearing Station.
 Temp. Capt. J. T. Morrison, M.B., F.R.C.S.
 Temp. Capt. H. H. P. Morton, 32nd Ambulance Train.
 Temp. Capt. (Acting Major) F. H. Moxon, M.B., 73rd General Hospital.
 Capt. W. P. Mulligan, O.B.E., M.B.
 Lieut.-Col. C. D. Myles, O.B.E., M.B.
 Temp. Capt. F. L. Napier, M.B., 45th Casualty Clearing Station.
 Temp. Capt. G. L. Neil, attached 182nd Tunnelling Company, Royal Engineers.
 Major (Acting Lieut.-Col.) R. E. U. Newman, M.C., M.B., 100th Field Ambulance.
 Capt. (Acting Major) C. V. Nicoll, 112th Field Ambulance.
 Temp. Capt. (Acting Major) A. A. O'Connor.
 Lieut.-Col. C. J. O'Gorman, D.S.O.
 Major (Acting Lieut.-Col.) D. de C. O'Grady.
 Qmr. and Capt. E. O'Hara, 10th Field Ambulance.
 Temp. Capt. M. W. B. Oliver, M.B., F.R.C.S.
 Qmr. and Major J. W. Osborne.
 Temp. Capt. H. B. Owens, 57th Field Ambulance.
 Major (Acting Lieut.-Col.) G. R. Painton.
 Temp. Capt. (Acting Major) A. C. Palmer, M.B., F.R.C.S.
 Major J. S. Pascoe, D.S.O.
 Temp. Capt. (Acting Major) J. A. Paterson, M.C., M.B., attached 2/3rd (London) Field
 Ambulance, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. E. J. Peill, M.B., F.R.C.S., 3rd Native Labour General Hospital.
 Major H. M. J. Perry.
 Temp. Capt. (Acting Major) W. de M. Peyton, M.B., attached 1st Stationary Hospital.
 Capt. (Acting Lieut.-Col.) E. Phillips, M.C., M.B., 106th Field Ambulance.
 Temp. Capt. S. E. Picken, M.B., 109th Field Ambulance.
 Temp. Capt. (Acting Major) B. Pickering, M.B., 20th Casualty Clearing Station.
 Temp. Capt. A. E. Pinniger, M.B.
 Temp. Capt. G. Pirie, M.B., 2nd Stationary Hospital.
 Capt. (Acting Lieut.-Col.) A. M. Pollard, D.S.O., 93rd Field Ambulance.
 Qmr. and Capt. A. G. Powell, 14th Stationary Hospital.
 Temp. Capt. (Acting Major) H. W. Powell, 137th Field Ambulance.
 Temp. Capt. (Acting Major) E. G. C. Price, M.B., 22nd Casualty Clearing Station.
 Temp. Capt. J. Pryce-Davies.
 Temp. Capt. G. R. B. Purce, M.C., M.B., 48th Casualty Clearing Station.
 Temp. Capt. E. H. Rainey, F.R.C.S.
 Capt. (Acting Lieut.-Col.) H. C. D. Rankin, M.B., 4th Field Ambulance.
 Temp. Capt. S. P. Rea, M.B., 108th Field Ambulance.
 Temp. Capt. W. A. Rees, 5th Casualty Clearing Station.
 Qmr. and Capt. (Acting Major) W. C. Renton.
 Lieut.-Col. (Acting Col.) W. Riach, C.M.G., M.D., Commanding 74th General Hospital.
 Temp. Capt. J. E. Richards, M.B., 107th Field Ambulance.
 Temp. Capt. (Acting Major) J. E. H. Roberts, M.B., F.R.C.S.

Temp. Capt. R. C. Robertson, M.B., attached 173rd Tunnelling Company, Royal Engineers.

Temp. Capt. G. Robinson, 2/1st (Wessex) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. W. J. Ronan, M.B.

Major (Acting Lieut.-Col.) F. E. Rowan-Robinson, M.B., Commanding 5th Stationary Hospital.

Temp. Lieut.-Col. R. J. Rowlette, M.D., F.R.C.S., attached 83rd General Hospital.

Major (Acting Lieut.-Col.) G. F. Rudkin, D.S.O., 9th Field Ambulance.

Temp. Capt. (Acting Major) J. C. Sale, D.S.O., M.C., 56th Field Ambulance.

Major (Temp. Lieut.-Col.) F. C. Sampson, D.S.O., M.D., 91st Field Ambulance.

Temp. Capt. (Acting Major) H. H. Sampson, M.C., M.B., F.R.C.S.

Temp. Capt. (Acting Major) H. W. Scawin.

Temp. Capt. A. Scott, M.B., 44th Field Ambulance.

Qmr. and Major R. Scott, 3rd Stationary Hospital.

Temp. Capt. (Acting Major) E. J. Belby.

Temp. Capt. H. P. Shackleton, M.B.

Temp. Capt. W. Shanks, M.B., attached Headquarters, 227th Army Brigade, Royal Field Artillery.

Temp. Hon. Major G. C. Shattuck.

Temp. Capt. H. L. Shelton, attached 48th Labour Group, Labour Corps.

Temp. Capt. H. J. Shone, M.B., 4th Cavalry Field Ambulance.

Major (Acting Lieut.-Col.) H. C. Sidgwick, M.B., 22nd Casualty Clearing Station.

Temp. Qmr. and Capt. H. F. Simnett, 103rd Field Ambulance.

Lieut.-Col. (Acting Col.) H. Simson.

Temp. Capt. A. F. S. Sladden, M.D.

Temp. Capt. J. M. Smeaton, attached 2/1st (Home Counties) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Capt. (Acting Lieut.-Col.) J. C. Sproule, 131st Field Ambulance.

Temp. Capt. C. M. Stallard, M.B., 61st Field Ambulance.

Temp. Capt. (Acting Major) E. G. Stanley, M.B., F.R.C.S., 61st Casualty Clearing Station.

Temp. Major F. N. G. Starr.

Temp. Capt. R. S. S. Statham, M.D., 6th General Hospital.

Temp. Capt. W. Stirling, M.B., 35th General Hospital.

Temp. Capt. A. Stokes, D.S.O., M.D., F.R.C.S.

Temp. Capt. (Acting Lieut.-Col.) H. Stokes, M.D., F.R.C.S.

Temp. Capt. C. P. A. Stranaghan, M.B., 49th Casualty Clearing Station.

Capt. (Acting Lieut.-Col.) J. W. C. Stubbs, M.C., M.V., 16th Field Ambulance.

Temp. Capt. E. J. Stuckey, M.B.

Temp. Capt. (Acting Major) C. Sullivan, F.R.C.S., 75th Field Ambulance.

Major (Acting Lieut.-Col.) G. G. Tabuteau, D.S.O., 1st Field Ambulance.

Temp. Capt. R. J. Tait, M.B., attached 2/2nd (Northern) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) D. C. Taylor, M.C., M.B., F.R.C.S.

Temp. Major G. Taylor, M.B., F.R.C.S.

Lieut.-Col. (Temp. Col.) W. Taylor, M.B., F.R.C.S.I., 83rd (Dublin) General Hospital.

Temp. Capt. L. H. Terry, Lucknow Casualty Clearing Station.

Temp. Qmr. and Capt. J. Tewkesbury, 74th General Hospital.

Major (Acting Lieut.-Col.) W. I. Thompson, D.S.O., M.B., attached 65th (East Lancashire) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Lieut.-Col.) F. R. Thornton, M.C., M.B., 15th Field Ambulance.

Temp. Capt. (Acting Major) R. Tindall, M.C., M.B., 27th Field Ambulance.

Temp. Capt. (Acting Major) A. T. Todd, M.B.

Temp. Capt. R. S. Topham, M.B., attached Royal Air Force.

Temp. Capt. R. H. Tribe, M.C., attached 15th Hussars.

Temp. Capt. C. N. Vaisey, attached 12th Battalion, Tank Corps.

Capt. (Acting Major) B. Varvill, M.C., 17th Field Ambulance.

Temp. Capt. (Acting Major) P. N. Vellacott, M.B., F.R.C.S.

Temp. Capt. (Acting Major) H. M. Vickers, M.B., 47th Field Ambulance.

Capt. F. S. Walker, M.D.

Temp. Capt. J. C. Walker, 41st Stationary Hospital.

Temp. Capt. A. B. Waller, M.B., attached Tank Corps.

Temp. Capt. (Acting Major) H. H. Warren, M.B., 45th Field Ambulance.

Major (Acting Lieut.-Col.) W. J. Waters, 21st Casualty Clearing Station.

Temp. Capt. E. J. M. Watson.

Temp. Capt. (Acting Major) H. C. Watson, M.C., M.B., 102nd Field Ambulance.

Capt. (Acting Lieut.-Col.) L. F. K. Way, 101st Field Ambulance.

Temp. Capt. F. E. Webb, M.B., attached 17th Battalion, Royal Sussex Regiment.
 Temp. Capt. (Acting Major) F. W. Wesley, M.D., 44th Casualty Clearing Station.
 Temp. Capt. F. Whitby, M.B., attached Headquarters, 38th Army Brigade, Royal

Field Artillery.

Major C. F. White, M.B.
 Temp. Capt. M. H. Whiting, M.B.
 Qmr. and Capt. J. Wickersham, 45th Casualty Clearing Station.
 Temp. Capt. A. R. Wightman, M.B.
 Major (Temp. Lieut.-Col) A. J. Williamson, M.B., 12th Casualty Clearing Station.
 Temp. Capt. J. Williamson, M.B., attached 19th Battalion, Middlesex Regiment.
 Temp. Capt. G. R. Wilson, attached 14th Battalion, Welsh Regiment.
 Temp. Capt. J. A. Wilson, M.B.
 Temp. Capt. F. A. Winder, M.B.
 Major J. L. Wood.

Temp. Capt. (Acting Major) P. R. Woodhouse, D.S.O., M.C., M.B., 9th Field Ambulance.

Temp. Capt. E. W. N. Wooler, M.B., 41st Casualty Clearing Station.
 Temp. Capt. H. Yellowlees, M.B.

Temp. Capt. C. R. Young, D.S.O., M.C., M.B., attached 1st Battalion, Shropshire Light Infantry.

6459 Cpl. B. R. Agnis, attached Headquarters, 5th Division.
 41801 Staff-Serjt. S. Ainsworth, 57th Field Ambulance.
 93901 Pte. (Acting Lance-Cpl.) R. Aitken, 49th Field Ambulance.
 115951 Pte. (Acting Serjt.) L. G. Alexander, attached 1/3rd (N. Mid.) Field Ambulance.

Royal Army Medical Corps (Territorial Force).

39308 Cpl. W. M. Allison.
 11 Cpl. (Temp. Serjt.) J. Andre, 39th General Hospital.
 40515 Staff-Serjt. L. Annen, 43rd Field Ambulance.
 53573 Cpl. S. S. Arden, attached Headquarters, 9th Division.
 47773 Pte. C. J. Armstrong, 6th Stationary Hospital.
 80731 Pte (Acting Cpl.) H. G. Arthur.
 37604 Serjt. W. T. S. Austin, 37th Field Ambulance.
 65610 Serjt. T. C. Ayres, 104th Field Ambulance.
 38605 Serjt. A. Ayto, 53rd Field Ambulance.
 31978 Serjt. E. Bailey, 17th Mobile Laboratory.
 46022 Cpl. (Acting Serjt.) J. A. Barker, 15th Field Ambulance.
 34798 Serjt.-Major F. G. L. Barnard, 56th General Hospital.
 68145 Cpl. (Acting Serjt.) G. H. Barratt, 20th Casualty Clearing Station.
 19001 Serjt. (Temp. Staff-Serjt.) J. Barritt, 3rd Cavalry Field Ambulance.
 72712 Cpl. T. B. Beal.
 18327 Cpl. (Temp. Staff-Serjt.) G. Beattie, 3rd Field Ambulance.
 19447 Cpl. (Acting Serjt.) H. E. Beckley, 3rd Field Ambulance.
 64988 Pte. A. G. Bell, 16th Field Ambulance.
 5816 Pte. (Acting Cpl.) G. A. Bell, 13th Motor Ambulance Convoy.
 60216 Pte. W. Bendall, 1st Mobile Laboratory.
 88032 Cpl. L. F. Bennett.
 19119 Serjt. W. E. Bennett, 1st Casualty Clearing Station.
 80024 Pte. V. F. Berrett.
 74770 Pte. S. Berryman, 37th Field Ambulance.
 92084 Pte. (Acting Serjt.) A. H. Bethell.
 67403 Serjt. W. R. Bland, 97th Field Ambulance.
 51338 Cpl. A. Boden, 21st Casualty Clearing Station.
 41806 Pte. F. G. Bourne, 3rd General Hospital.
 45519 Cpl. (Acting Serjt.) J. G. Bourne, 54th Field Ambulance.
 77834 Cpl. H. Bradley, attached Headquarters, 14th Division.
 31641 Serjt.-Major J. Brett, 102nd Field Ambulance.
 44620 Pte. G. W. Brown.
 36891 Pte. E. Brown Grant.
 36892 Pte. (Acting Cpl.) J. G. Brown Grant.
 5701 Pte. (Acting Lance-Cpl.) F. G. Bush, 1st Casualty Clearing Station.
 45120 Cpl. C. L. Cabannes, 16th Advanced Depot Medical Stores.
 30350 Staff-Serjt. R. W. Cargill, 60th Field Ambulance.
 6534 Pte. (Acting Serjt.) R. W. Cathrine.
 2102 Staff-Serjt. (Temp. Qmr.-Serjt.) F. T. Catton, 19th Field Ambulance.
 56758 Pte. C. L. Coaster, 17th Field Ambulance.
 743 Serjt. (Temp. Staff-Serjt.) F. C. Coles.
 34947 Staff-Serjt. A. Coulter, 18th Casualty Clearing Station.
 88567 Pte. W. J. Court, 7th Field Ambulance.

527728 Pte. L. Penney, 1st (Lond.) Sanitary Company, attached 113th Sanitary Section.
 366193 Temp. Serjt.-Major W. J. Phelps, 2nd (Welsh) Field Ambulance, attached 48th Stationary Hospital.
 364218 Pte. T. Poole, 1/1st (Welsh) Field Ambulance.
 545008 Qmr.-Serjt. L. Skeeles, 114th Sanitary Section.
 318009 Staff-Serjt. J. Sloss, 1/2nd (Low.) Field Ambulance, attached 69th General Hospital.
 472005 Temp. Serjt.-Major T. W. Smith, Eastern Mounted Brigade Field Ambulance, attached 78th General Hospital.
 473428 Pte. A. Tanner, 1st (E. Ang.) Field Ambulance, attached Indian Cavalry Base Depot.
 434011 Serjt. (Acting Staff-Serjt.) W. E. S. Taylor, 2nd (S. Mid.) Mounted Brigade Field Ambulance, attached 10th Cavalry Brigade Combined Field Ambulance.
 368120 Pte. D. M. Thomas, 1/2nd (Welsh) Field Ambulance, attached 171st Indian Combined Field Ambulance.
 545290 Serjt. (Acting Qmr.-Serjt.) E. Turner, 2nd (London) Sanitary Company, attached 137th Indian Stationary Hospital.
 527752 Serjt. (Acting Staff-Serjt.) V. C. Watts, 1st (London) Sanitary Company, attached 95th Sanitary Section.
 444082 Serjt. F. C. Wembridge, 2nd Southern General Hospital.

War Office,
 June 5, 1919.

The following dispatch has been received by the Secretary of State for War from General F. R. Earl of Cavan, K.P., K.C.B., M.V.O., Commander-in-Chief of the British Forces in Italy:—

General Headquarters, Italy,
 January 18, 1919.

SIR,—I have the honour to submit a list of names of those Officers, Ladies, Non-commissioned Officers and Men serving, or who have served, under my command during the period September 15, 1918, to December 31, 1918, whose distinguished and gallant services and devotion to duty I consider deserving of reward.

I have the honour to be, Sir,
 Your obedient Servant,

CAVAN, General,
 Commander-in-Chief, The British Forces in Italy.

Col. T. Du B. Whaite, C.M.G., M.B., Army Medical Service (formerly Royal Army Medical Corps).

ARMY MEDICAL SERVICE.

Col. S. A. Archer, C.M.G. (formerly Royal Army Medical Corps).
 Lieut.-Col. and Brevet Col. A. Chopping, C.M.G., Royal Army Medical Corps.
 Capt. (Acting Major) M. Coplans, D.S.O., M.D., Royal Army Medical Corps (Territorial Force).
 Col. J. V. Forrest, C.M.G., M.B. (formerly Royal Army Medical Corps).
 Temp. Capt. (Acting Major) R. H. Lucas, M.C., Royal Army Medical Corps.
 Major-Gen. F. R. Newland, C.B., C.M.G., M.B. (formerly Royal Army Medical Corps).
 Col. R. Pickard, C.M.G., T.D., M.D., Royal Army Medical Corps (Territorial Force).
 Temp. Capt. A. Shelley, M.B., Royal Army Medical Corps.
 Capt. (Acting Major) T. O. Thompson, M.D., Royal Army Medical Corps.
 Temp. Col. C. G. Watson, C.M.G., F.R.C.S.
 Capt. and Brevet Major (Acting Col.) W. G. Wright, D.S.O., Royal Army Medical Corps.

ROYAL ARMY MEDICAL CORPS.

Capt. (Acting Lieut.-Col.) J. J. H. Beckton, 69th Field Ambulance.
 Major and Brevet Lieut.-Col. (Temp. Lieut.-Col.) J. G. Bell, D.S.O., M.B., 39th Casualty Clearing Station.
 Qmr. and Capt. (Temp. Major) A. Bennett, M.C., 14th Base Depot Medical Stores.
 Major (Acting Lieut.-Col.) C. Bramhall, 51st Stationary Hospital.
 Temp. Capt. R. V. Dolbey, F.R.C.S., 24th Casualty Clearing Station.
 Lieut.-Col. M. W. Falkner, F.R.C.S.I., 38th Stationary Hospital.
 Temp. Capt. (Acting Lieut.-Col.) E. A. Gates.
 Major (Acting Lieut.-Col.) T. H. Gibbon, M.D., 79th General Hospital.
 Capt. (Acting Lieut.-Col.) J. G. Gill, D.S.O., M.C., M.B., Commanding 71st Field Ambulance.
 Qmr. and Temp. Lieut. T. H. Griggs, 21st Field Ambulance.
 Temp. Capt. J. Jardine, M.D., F.R.C.S. Edin., 24th Casualty Clearing Station.

Temp. Capt. (Acting Major) H. R. Macintyre, D.S.O., M.C., M.D., 69th Field Ambulance.

Temp. Capt. S. Marle, attached 1/2nd (S. Mid.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. K. D. Melville, M.D., 62nd General Hospital.

Temp. Capt. (Acting Major) R. Millar, M.D., 9th Casualty Clearing Station (Capt., Canadian Army Medical Corps).

Capt. (Temp. Major) C. J. O'Reilly, M.C., 70th Field Ambulance.

Temp. Capt. W. Parker, M.C., M.B., 79th General Hospital.

Temp. Capt. C. H. G. Prance, 21st Field Ambulance.

Temp. Lieut.-Col. C. D. Pye-Smith, D.S.O., M.C., M.B., F.R.C.S., 24th Casualty Clearing Station.

Temp. Capt. A. E. Thompson, M.C., M.D., attached 8th Battalion Yorks and Lincs. Regiment.

Capt. (Acting Lieut.-Col.) E. W. Vaughan, M.C., M.B., 23rd Field Ambulance.

Temp. Capt. A. G. Wilson, attached 51st Stationary Hospital "E."

43418 Serjt. (Acting Serjt.-Major) J. B. Bell, 6th Native Laboratory Hospital.

17 Serjt. A. C. Berry, 21st Field Ambulance.

104110 Pte. E. G. Castle, attached Headquarters, 23rd Division.

15671 Qmr.-Serjt. (Temp. Serjt.-Major) B. W. Cole, 51st Stationary Hospital.

90476 Cpl. (Acting Serjt.) N. Fletcher, attached Lines of Communication.

90781 Serjt. J. A. Goodman, 70th Field Ambulance.

19029 Staff-Serjt. (Acting Serjt.-Major) R. E. Harvey, 39th Casualty Clearing Station.

24 Staff-Serjt. P. H. Haynes, attached Base Area.

58429 Pte. J. Hurdman, 70th Field Ambulance.

89155 Serjt. (Acting Qmr.-Serjt.) C. H. Lee, 38th Stationary Hospital.

31909 Pte. (Acting Cpl.) W. H. Lewis, 71st Field Ambulance.

7897 Pte. J. A. Maloney, 22nd Field Ambulance.

40058 Pte. F. Osborne, 71st. Field Ambulance.

417461 Qmr.-Serjt. (Temp. Serjt.-Major) F. J. Steele, 11th General Hospital.

59439 Pte. J. Tabernacle, 69th Field Ambulance.

6587 Cpl. C. Wright, attached Headquarters, 7th Division.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. W. Broughton-Alcock, 11th General Hospital.

Capt. (Acting Major) H. H. Brown, attached 1/1st (S. Mid.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Capt. H. P. Gabb, M.C., 22nd Field Ambulance.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Capt. K. S. Beken, 2nd (Lond.) Sanitary Company (Commanding 75th Sanitary Section)

Major (Temp. Lieut.-Col.) G. H. L. Hammerton, C.M.G., D.S.O., 9th Casualty Clearing Station.

Capt. (Acting Major) C. E. K. Herapath, M.C., M.B., 1/3rd (S. Mid.) Field Ambulance.

Qmr. and Lieut. J. J. Llewellyn, 23rd Field Ambulance.

Capt. (Acting Lieut.-Col.) P. Moxey, 21st Field Ambulance.

Capt. C. C. Robinson, M.B., attached 1/7th Battalion Royal Warwick Regiment (Territorial Force).

439,128 Pte. J. Andrews, 1/3rd (S. Mid.) Field Ambulance.

437192 Serjt. E. J. Bryden, 1/2nd (S. Mid.) Field Ambulance.

528274 Pte. (Acting Serjt.) R. B. Ling, 110th Sanitary Section.

435196 Pte. (Acting Lance-Cpl.) W. H. Walters, 1/1st (S. Mid.) Field Ambulance.

War Office,

June 5, 1919.

The following dispatch has been received by the Secretary of State for War from Lieutenant-General Sir G. F. Milne, K.G.B., K.C.M.G., D.S.O., Commanding-in-Chief, British Salonika Force :—

General Headquarters,

British Salonika Force,

Constantinople,

March 9, 1919.

SIR,—I have the honour to submit herewith a list of names of the Officers, Warrant Officers, Non-Commissioned Officers, Men and Nursing Staff, whom I desire to bring to your notice for their distinguished and gallant services during the period from October 1, 1918, to March 1, 1919.

I have the honour to be, Sir,

Your obedient servant,

(Signed) G. F. MILNE, *Lieut.-General,*
Commanding-in-Chief, British Salonika Force.

Capt. (Acting Major) A. S. Cane, M.D., Royal Army Medical Corps.
 Capt. and Brevet Major C. A. Cardwell, O. & B.L.I. (Special Reserve).
 Major and Brevet Lieut.-Col. (Acting Col.) C. W. Holden, D.S.O., Royal Army Medical Corps.

Major-Gen. M. P. C. Holt, K.C.M.G., C.B., D.S.O., Army Medical Service.
 Capt. (Acting Major) N. V. Lothian, M.C., M.B., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) F. S. Penny, C.M.G., D.S.O., M.B., Royal Army Medical Corps.

ARMY MEDICAL SERVICE.

Temp. Col. L. S. Dudgeon, C.M.G., F.R.C.P.

ROYAL ARMY MEDICAL CORPS.

Temp. Capt. (Acting Major) H. B. Atlee, M.C., M.D.
 Temp. Capt. H. S. Banks, M.B.
 Temp. Capt. W. Barritt.
 Temp. Capt. O. A. Beaumont.
 Temp. Capt. (Acting Major) R. K. Birnie, M.B.
 Temp. Capt. J. Brydoun, F.R.C.S.
 Temp. Capt. (Acting Major) S. Campbell, M.B.
 Temp. Capt. T. D. Cumberland, M.B.
 Temp. Capt. H. H. L. Ellison.
 Temp. Capt. R. R. Elworthy, O.B.E., M.D.
 Temp. Capt. A. E. Fiddian.
 Temp. Capt. C. Y. Flewitt, M.B.
 Temp. Capt. (Acting Major) W. Haward, M.B.
 Temp. Capt. H. E. Heapy, M.D.
 Temp. Capt. R. Heaton.
 Temp. Capt. (Acting Major) J. V. Holmes, M.B.
 Temp. Capt. G. P. B. Huddy.
 Temp. Capt. (Acting Major) J. Hughston, M.B. (died of wounds).
 Lieut.-Col. H. E. R. James, C.B., C.M.G., F.R.C.S.
 Temp. Capt. (Acting Major) J. A. Jones, M.B., F.R.C.S.
 Temp. Capt. W. Landsborough, M.B.
 Qmr. and Temp. Capt. F. G. Lovell.
 Temp. Capt. (Acting Major) W. V. Macaskie, M.B.
 Temp. Capt. (Acting Major) G. D. Mathewson, M.B.
 Capt. (Acting Major) O. R. McEwen.
 Temp. Capt. H. L. Messenger, M.C.
 Temp. Capt. F. M. B. Newey.
 Temp. Qmr. and Capt. F. Richardson.
 Lieut.-Col. G. B. Riddick.
 Qmr. and Capt. (Temp. Major) H. Sprinks.
 Major (Acting Lieut.-Col.) G. H. Stevenson, D.S.O., M.B.
 Temp. Capt. J. R. Stott, M.B.
 Temp. Capt. E. R. Thompson, M.B.
 Capt. and Brevet Major (Acting Lieut.-Col.) P. S. Tomlinson.
 Temp. Capt. J. Warnock, M.D.
 Temp. Capt. L. T. Wells.
 Temp. Lieut.-Col. C. M. Wenyon, C.M.G., M.B.
 Temp. Capt. A. Wilkin.
 Temp. Capt. J. K. Willis, M.B.
 Temp. Major H. W. Wiltshire, D.S.O., M.D.
 Temp. Capt. (Acting Major) L. D. Woods.
 Temp. Capt. F. H. Young.
 2148 Serjt. (Acting Qmr.-Serjt.) J. Ashcroft.
 16447 Staff-Serjt. W. J. Ashworth.
 42112 Pte. E. J. Bell.
 43420 Serjt. J. Bonsall.
 94356 Pte. (Acting Lance-Serjt.) H. Bromhead.
 100816 Cpl. (Acting Serjt.) H. J. Brooks.
 63398 Pte. M. Brusby.
 22387 Pte. (Acting Cpl.) J. Buckley.
 33022 Pte. T. Burnett.
 89002 Serjt. E. Butterworth.
 96667 Pte. F. Cheeseman.
 82305 Pte. (Acting Serjt.) G. V. Churchman.
 59582 Staff-Serjt. H. A. Constable.
 24049 Pte. (Acting Cpl.) A. H. Crowle.

92735 Pte. M. Davies.
 81913 Pte. T. I. Davies.
 10611 Pte. (Acting Lance-Serjt.) J. Devine.
 49823 Staff-Serjt. (Acting Serjt.-Major) R. Dunn.
 46621 Pte. P. Fenton.
 119464 Pte. W. Ferrell.
 9389 Pte. H. G. Field.
 8306 Pte. (Acting Serjt.) F. Fowler.
 55006 Serjt. F. Foxall.
 37222 Serjt. W. Haiselden.
 12052 Staff-Serjt. (Temp. Serjt.-Major) F. C. Halkett.
 60286 Pte. (Acting Serjt.) J. A. C. Hampden.
 47840 Pte. J. Harrison.
 30179 Serjt.-Major L. McL. Hayes.
 39747 Cpl. (Acting Serjt.) S. Hogg.
 11287 Pte. (Acting Lance-Cpl.) T. H. Hollingworth.
 69487 Cpl. (Acting Lance-Serjt.) C. Howe.
 100609 Pte. A. Hunter.
 28769 Pte. J. W. Illingworth.
 874 Staff-Serjt. (Acting Serjt.-Major) F. A. Johnson.
 59956 Cpl. H. Jones.
 117042 Pte. J. Jones.
 110318 Cpl. (Acting Serjt.) O. E. L. Jones.
 78897 Serjt. J. J. Laurence.
 26766 Pte. G. B. Lee.
 15983 Temp. Serjt.-Major C. E. Lister.
 221 Cpl. (Acting Serjt.) G. J. Long.
 93733 Pte. J. Mackenzie.
 33376 Serjt.-Major A. J. Magee.
 89363 Pte. (Acting Cpl.) A. Márr.
 22129 Cpl. (Acting Lance-Serjt.) A. S. Marshall.
 6231 Serjt. (Temp. Serjt.-Major) P. J. Martin.
 53778 Cpl. W. Mayes.
 79188 Pte. M. McDowell.
 60031 Serjt. (Acting Staff-Serjt.) A. Miles.
 46435 Cpl. H. S. Morgan.
 32630 Pte. S. Moulton.
 70913 Pte. J. Murphy.
 26078 Cpl. A. H. Naish.
 105352 Pte. F. G. Orchard.
 93660 Serjt.-Major W. A. Paul.
 57448 Pte. (Acting Cpl.) W. Pizzie.
 37886 Serjt. A. Pomfret.
 904 Pte. (Acting-Serjt.) J. T. Reese.
 104945 Serjt. (Acting Staff-Serjt.) T. Rocum.
 89157 Pte. G. H. Rowse.
 85082 Pte. (Acting Cpl.) J. D. Rushton.
 19515 Staff-Serjt. G. D. Salter.
 286906 Staff-Serjt. F. J. Smith.
 92389 Qmr.-Serjt. (Acting Serjt.-Major) W. J. Smith.
 26028 Serjt.-Major W. V. H. Smith.
 55851 Pte. F. Standish.
 26020 Serjt.-Major A. Stead.
 42757 Cpl. W. A. Tither.
 495620 Pte. F. E. Upton.
 53015 Serjt. D. Wallace.
 28111 Pte. W. Wightman.
 19662 Pte. O. W. Woodward.
 24205 Serjt. S. C. Yeomans.
 23910 Pte. (Acting Cpl.) R. T. Young.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. A. La B. Clarke, M.B.
 Capt. G. Ewen, M.B.
 Capt. (Acting Major) J. W. P. Harkness, M.B.
 Capt. A. C. MacDonald.
 Capt. W. McElroy.

Capt. (Acting Major) O. J. O'B. O'Hanlon, M.B., F.R.C.S.
 Capt. B. J. Byrie, M.B.
 Capt. J. H. Sewart.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Capt. J. A. Andrews, 2nd (London) Sanitary Company.
 Capt. H. A. T. Fairbank, D.S.O., F.R.C.S.
 Qmr. and Capt. B. Fairweather, 1/3rd (London) Field Ambulance.
 Capt. (Temp. Lieut.-Col.) A. W. Falconer, D.S.O., M.B., 1st Scottish General Hospital.
 Capt. C. E. Ferrey, 1st (London) Sanitary Company.
 Capt. (Temp. Lieut.-Col.) E. G. Gauntlett, D.S.O., M.B., F.R.C.S.
 Capt. T. S. Hele, M.D.
 Qmr. and Capt. J. Keogh, 3rd (H.C.) Field Ambulance (Died).
 Major (Temp. Lieut.-Col.) A. E. Kidd, M.B., 3rd (High) Field Ambulance.
 Qmr. and Capt. A. J. H. Knights, T.D., 1/2nd (London) Field Ambulance.
 Capt. (Acting Major) J. C. Marklove, 3rd (H.C.) Field Ambulance.
 Capt. and Brevet Major W. J. F. Mayne, M.B., 1st (London) Sanitary Company.
 Capt. (Temp. Major) R. P. Nash.
 Capt. (Temp. Lieut.-Col.) J. Patrick, M.B., F.R.C.S., 3rd Scottish General Hospital.
 Capt. (Acting Major) H. A. Playfair-Robertson, M.B., 1st (H.C.) Field Ambulance.
 Capt. J. T. M. H. Simson.
 Capt. (Acting Major) R. M. Vick.
 Major (Acting Lieut.-Col.) J. Ward, D.S.O., 1st (H.C.) Field Ambulance.
 Capt. J. Waterson, 1st (London) Sanitary Company.
 Capt. W. C. D. Wilson, 2/2nd (High) Field Ambulance.
 528280 Pte. (Acting Cpl.) J. Barringer, 1st (London) Sanitary Company.
 330289 Serjt. R. A. Bell, 2/3rd (Northumberland) Field Ambulance.
 527879 Lance-Cpl. (Acting Cpl.) W. Brace, 1st (London) Sanitary Company.
 545861 Serjt. (Acting Staff-Serjt.) F. R. Chalmers, 2nd (London) Sanitary Company.
 527651 Cpl. (Acting Serjt.) E. J. Cushion, 1st (London) Sanitary Company.
 527761 Serjt. (Acting Staff-Serjt.) H. V. Dixon, 1st (London) Sanitary Company.
 528275 Pte. (Acting Cpl.) T. Douglas, 1st (London) Sanitary Company.
 528050 Cpl. (Acting Serjt.) F. Frampton, 1st (London) Sanitary Company.
 527384 Lance-Cpl. (Acting Cpl.) W. W. S. Hall, 1st (London) Sanitary Company.
 527099 Pte. (Acting Serjt.) J. Handscombe, 1st (London) Sanitary Company.
 493007 Serjt. A. H. Holtum, 1st (H.C.) Field Ambulance.
 527108 Pte. (Acting Lance-Cpl.) A. J. Houlding, 1st (London) Sanitary Company.
 527252 Pte. (Acting Cpl.) Jack, 1st (London) Sanitary Company.
 305142 Serjt. W. Kinnear, 1/3rd (High) Field Ambulance.
 527127 Serjt. T. E. Lineker, 1st (London) Sanitary Company.
 527127 Pte. (Acting Lance-Cpl.) S. E. Monk, 1st (London) Sanitary Company.
 510131 Pte. F. Palmer, 1/2nd (London) Field Ambulance.
 510004 Staff-Serjt. A. Rayner, 1/2nd (London) Field Ambulance.
 564269 Pte. (Acting Serjt.) J. M. Russell, 2nd (London) Sanitary Company.
 497192 Pte. (Acting Cpl.) W. G. F. Searl, 2nd (H.C.) Field Ambulance.
 510248 Pte. E. G. Smith, 1/2nd (London) Field Ambulance.
 512166 Cpl. (Acting Serjt.) J. E. Wickens, 1/3rd (London) Field Ambulance.

MAJOR-GENERAL W. MALLESON'S FORCE.

Medical Department.

Temp. Lieut. Mohamed Nawaz, Indian Medical Service.
 75366 Acting Cpl. E. E. Bate, Royal Army Medical Corps.

War Office,

June 5, 1919

The Secretary of State for War has received the following dispatch addressed to the Chief of the General Staff, India, by Lieutenant-General Sir W. R. Marshall, K.C.B., K.C.S.I., Commanding-in-Chief, Mesopotamian Expeditionary Force :—

General Headquarters,

Mesopotamian Expeditionary Force.

February 7, 1919.

SIR,—With reference to paragraph 39 of my dispatch dated February 1, 1919, I have the honour to submit herewith a list of names of those Officers, Ladies, Warrant and Non-Commissioned Officers and Men serving or who have served under my command, whose distinguished and gallant devotion to duty I consider deserving of special mention :—

I have the honour to be, Sir,

Your obedient servant,

W. R. MARSHALL, *Lieut.-General,*
Commanding-in-Chief, Mesopotamian
Expeditionary Force.

Col. (Temp. Major-Gen.) A. P. Blenkinsop, C.B., C.M.G., Army Medical Service.
80938 Pte. (Acting-Serjt.) R. W. Boniface, Royal Army Medical Corps.

ARMY MEDICAL SERVICE.

Col. P. Evans, C.M.G., M.B.
Col. J. D. Ferguson, C.M.G., D.S.O.
Temp. Col. T. P. Legg, C.M.G., M.B., F.R.C.S.
Col. A. H. Morris.
Col. W. T. Mould.
Col. W. H. Starr, C.B., C.M.G.
Temp. Col. W. H. Willcox, C.B., C.M.G., M.D., F.R.C.P.

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. (Temp. Col.) J. H. R. Bond, D.S.O.
Temp. Capt. W. Brown.
Temp. Capt. T. P. Buist, M.B.
Lieut.-Col. (Temp. Col.) E. W. W. Cochrane, D.S.O., M.B.
Temp. Capt. W. MacC. Conley, M.B.
Major (Acting Lieut.-Col.) W. Davis, M.B.
Lieut. Col. G. G. Delap, C.M.G., D.S.O.
Capt. and Brevet Major L. Dunbar, M.B.
Capt. (Acting Lieut.-Col.) W. J. Dunn, M.B.
Lieut.-Col. J. G. Foster, M.B.
Lieut. (Temp. Capt.) O. D. Jarvis, M.B.
Temp. Capt. I. W. Jones, M.B.
Capt. (Acting Major) D. H. C. MacArthur, M.D.
Temp. Capt. A. MacMillan.
Capt. and Brevet Major W. MacNaughtan, M.B.
Temp. Capt. W. M. Menzies, M.B.
Capt. and Brevet Major T. J. Mitchell, D.S.O., M.B.
Temp. Qmr. and Lieut. J. S. Moore.
Lieut.-Col. (Temp. Col.) H. M. Morton, D.S.O., M.B.
Temp. Capt. S. Murray, M.B.
Major H. W. Russell, M.D.
Major (Acting Lieut.-Col.) A. W. Sampey.
Temp. Capt. A. F. Sanderson.
Temp. Major (Acting Lieut.-Col.) E. W. Skinner, M.D.
Lieut.-Col. and Brevet Col. J. M. Sloan, C.M.G., D.S.O., M.B.
Capt. (Acting Major) E. P. A. Smith, M.C., M.B.
Temp. Capt. C. R. Taylor, M.B.
Capt. R. R. Thompson, M.C.
Capt. (Acting Major) H. C. Todd, M.B.
Temp. Capt. A. Topping, M.B.
Temp. Qmr. and Lieut. G. B. Walker, M.C.
Major N. D. Walker, M.B.
Capt. J. M. Weddell.
Lieut.-Col. J. F. Whelan, D.S.O., M.B.
Temp. Capt. J. S. Young, M.D.
76205 Pte. (Acting Cpl.) S. C. Atkinson.
97905 Pte. (Acting Serjt.) H. M. Bennett.
28173 Cpl. (Acting Serjt.) R. T. G. Bradley.
88408 Pte. (Acting Serjt.) A. M. Brine.
27882 Pte. (Acting Lance-Cpl.) W. Browning.
97899 Pte. (Acting Serjt.) P. J. Cleary.
79850 Pte. (Acting Serjt.) E. J. Cooper.
79578 Serjt. J. Cumming.
105643 Pte. W. J. Greenhalgh.
59264 Cpl. (Acting Regt.-Serjt.-Major) C. Grice.
79315 Pte. (Acting Serjt.) H. R. Halkes.
9413 Pte. (Acting Serjt.) S. Hall, 21st Lancers, attached Royal Army Medical Corps.
39428 Serjt. (Acting Staff-Serjt.) A. T. Hawkes.
58901 Pte. (Acting Serjt.) R. H. Heaney.
12748 Pte. C. Homer.
14926 Serjt.-Major W. H. G. Hunt.
102810 Pte. C. Isherwood.
32621 Pte. (Acting Serjt.) A. Johnson.
83823 Pte. (Acting Serjt.) S. W. Longthorne.

77964 Pte. (Acting Cpl.) C. H. Marshall.
 29533 Cpl. (Acting Staff-Serjt.) F. J. H. Martin.
 77021 Pte. J. Middleton, 2nd (Garrison) Battalion, Northumberland Fusiliers, attached
 Royal Army Medical Corps.
 59763 Pte. (Acting Staff-Serjt.) W. Middleton.
 12506 Qmr.-Serjt. (Acting Regt.-Serjt.-Major) P. J. O'Rourke.
 83876 Pte. (Acting Serjt.) L. W. Oxley.
 25038 Serjt. H. Payne.
 28022 Serjt. (Acting Staff-Serjt.) D. Pugh.
 21872 Pte. (Acting Lance-Cpl.) J. L. Read.
 83506 Pte. (Acting Serjt.) A. C. Roberts.
 2 Serjt. N. Schokman, Ceylon, Sanitary Section, attached Royal Army Medical Corps
 249 Serjt. (Acting Staff-Serjt.) A. H. Scovell.
 77549 Pte. (Acting Company Qmr.-Serjt.) C. R. Spraggon.
 79025 Pte. F. Stephens.
 18170 Staff-Serjt. (Acting Regimental Serjt.-Major) L. Sufrin.
 97921 Cpl. (Acting Serjt.) G. P. Trasler.
 105907 Pte. O. Turner.
 78697 Pte. E. Vaughan.
 104458 Pte. (Acting Cpl.) W. Walton.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. J. W. W. Baillie, M.B.
 Capt. J. M. H. Campbell.
 Capt. (Acting Major) J. P. Charnock, M.B.
 Capt. W. Dunlop, O.B.E., M.B.
 Capt. H. L. Garson, M.C.
 Capt. R. W. Macdonald, M.B.
 Capt. K. B. MacGlashan, M.D., F.R.C.S. Edin.
 Capt. J. M. Morrison, M.B.
 Capt. J. B. Steven, M.B.
 Capt. (Acting Major) P. Thorton, M.C.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Capt. A. E. Bonham.
 Capt. T. A. Fisher.
 Lieut.-Col. F. E. Fremantle, M.B., F.R.C.S., F.R.C.P.
 Major (Acting Lieut.-Col.) R. Griffith.
 Capt. F. T. H. Wood, M.B.
 527370 Cpl. (Acting Serjt.) R. H. Carter, 1st (London) Sanitary Company.
 456127 Pte. (Acting Serjt.) C. E. Coey.
 505021 Staff-Serjt. A. Longstaff, 27th Sanitary Section.
 505029 Pte. (Acting Lance-Cpl.) G. T. Portus, 99th Sanitary Section.
 464037 Cpl. (Acting Staff-Serjt.) H. W. Rowsell, 101st Sanitary Section.
 456126 Pte. (Acting Serjt.) R. Sharp.

NORTH PERSIAN FORCE.

Royal Army Medical Corps.

Temp. Capt. H. G. Baynes, M.B.
 Capt. (Acting Lieut.-Col) E. T. Burke, D.S.O. (Special Reserve).
 Temp. Capt. W. A. L. Dunlop, M.B.
 Capt. (Temp. Major) O. H. Mayor, M.B. (Special Reserve).
 Capt. J. S. Sloper, M.B.
 Lieut.-Col. W. M. B. Sparkes, D.S.O.
 105484 Pte. (Acting Serjt.) J. F. Collinge.
 36555 Qmr.-Serjt. (Acting Company Serjt.-Major) H. J. Stark.

War Office,
 June 5, 1919.

The following dispatch has been received by the Secretary of State for War from
 Lieutenant-General Sir J. L. Van Deventer, K.C.B., C.M.G., Commanding-in-Chief, East
 African Force:—

Pretoria,
January 20, 1919.

SIR,—I have the honour to forward herewith my recommendations in favour of the undermentioned Officers, Ladies, Warrant Officers, Non-Commissioned Officers and Men for valuable services rendered during the period August 1, 1918, to the conclusion of hostilities.

I have the honour to be, Sir,
Your obedient servant,
J. L. VAN DEVENTER,
Lieutenant-General,
Commanding-in-Chief, East African Force.

June 5, 1919.

ROYAL ARMY MEDICAL CORPS.

Temp. Capt. W. D. Allan, M.B.
Temp. Capt. J. Brierley, M.D.
Temp. Capt. R. P. Garrow, M.B.
Temp. Major T. C. McKenzie, M.B.
Temp. Capt. N. S. Neill, M.B.
Temp. Capt. C. H. Shaw, M.B.
Temp. Capt. J. A. Struthers, M.B.
Temp. Capt. L. H. D. Thornton.
2034 Cpl. H. F. Beck.
57575 Serjt. R. Buxton.
9828 Staff-Serjt. C. G. Clarke.
43913 Serjt. J. Collier.
Serjt. A. Dawber.
79120 Serjt. D. G. Evans.
97378 Pte. A. C. Farrier.
68975 Serjt. E. A. Forbes.
83574 Serjt. I. N. Irving.
6273 Pte. H. A. H. Parnell.
10285 Pte. (Acting Lance-Cpl.) A. E. Rolston.
98412 Cpl. T. G. Seaward.
6414 Pte. W. L. Till.
63452 Pte. T. Williamson.
79475 Serjt. S. A. Wright.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

Capt. J. F. C. Braine.
Capt. F. J. C. Johnstone, M.B.
Capt. R. Lloyd-Jones.
Capt. G. L. Malcolm-Smith.
Capt. R. R. Scott, M.C.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

318345 Serjt. J. Mather.
322029 Qmr.-Serjt. W. McKewan.
475291 Pte. J. A. Priest.
545263 Serjt. C. N. Rowe.
545850 Cpl. (Acting Staff-Serjt.) F. Russell.
120089 Staff-Serjt. F. G. Waring.

War Office,
June 5, 1919.

The names of the undermentioned have been brought to the notice of the Secretary of State for War by Major-General W. E. Ironside, C.M.G., D.S.O., Commanding-in-Chief, Northern Russia Expeditionary Force, for valuable and distinguished services rendered in connexion with the operations at Archangel:—

Capt. (Acting Lieut.-Col.) D. C. L. Fitzwilliams, M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Capt. N. H. Harrison, Royal Army Medical Corps (Special Reserve).

Capt. A. Irvine-Fortescue, M.B., Royal Army Medical Corps.

44337 Qmr.-Serjt. A. S. Clarke, Royal Army Medical Corps.

339171 Cpl. (Acting Serjt.) D. W. Conway, Royal Army Medical Corps (Territorial Force).

13921 Staff-Serjt. (Acting Serjt.-Major) J. W. Cooper, Royal Army Medical Corps.

318203 Pte. (Acting Staff-Serjt.) W. B. Findlay, Royal Army Medical Corps.
 29074 Serjt. J. A. Hanman, Royal Army Medical Corps.
 27225 Qmr.-Serjt. (Temp. Serjt.-Major) W. Lee, Royal Army Medical Corps.
 4427 Cpl. (Acting Serjt.) A. H. Richards, Royal Army Medical Corps.
 545500 Cpl. (Acting Serjt.) O. A. Stunt, Royal Army Medical Corps (Territorial Force).
 417384 Pte (Acting Lance-Cpl.) J. S. Woodhouse, Royal Army Medical Corps.

War Office,

June 5, 1919.

The names of the undermentioned have been brought to the notice of the Secretary of State for War by Major-General C. C. M. Maynard, C.B., C.M.G., D.S.O., Commanding-in-Chief, Allied Land Forces, Murmansk District, for valuable and distinguished services rendered in connexion with the operations at Murmansk :—

Capt. (Temp. Major) C. G. G. Keane, Royal Army Medical Corps.
 Temp. Capt. A. H. Macklin, M.C., M.B., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) G. Muir, Royal Army Medical Corps.
 Capt. (Temp. Lieut.-Col.) J. J. D. Roche, M.B., Royal Army Medical Corps.
 22613 Pte. Gardner, 86th General Hospital, Royal Army Medical Corps.
 129467 Pte. C. Grocey, Royal Army Medical Corps.
 51455 Pte (Acting Serjt.) F. Hines, 127th Sanitary Section, Royal Army Medical Corps.
 115535 Pte. H. W. Phillips, Royal Army Medical Corps.
 393001 Qmr.-Serjt. (Temp. Serjt.-Major) J. Tunnah, Royal Army Medical Corps.

War Office,

June 5, 1919.

The following dispatch has been received by the Secretary of State for War from Major-General Sir L. O. FitzM. Stack, K.B.E., C.M.G., Acting Sirdar of the Egyptian Army and Acting Governor-General of the Sudan :—

Headquarters,
 Egyptian Army and Sudan Government,
 Khartoum,

January 26, 1919.

SIR,—I have the honour to forward herewith the names of Officers, officials and others whose work in connexion with military operations, and the situation in the Sudan created by the War, is deserving of special notice and commendation.

I have the honour to be, Sir,

Your obedient Servant.

LEE STACK, Major-General,
 Acting Sirdar of the Egyptian Army and
 Acting Governor-General of the Sudan.

NO. 1.—MILITARY OPERATIONS.

Lieut.-Col. F. F. Carroll, D.S.O., M.B., Royal Army Medical Corps.
 Major C. Cassidy, M.C., M.B., Royal Army Medical Corps.
 Capt. S. McK. Saunders, Royal Army Medical Corps.

NO. 2.—ADMINISTRATIVE SERVICES.

Major R. G. Archibald, D.S.O., M.B., Royal Army Medical Corps.
 Major D. S. B. Thomson, M.B., Royal Army Medical Corps.

War Office,

June 7, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign :—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Croix de Guerre.

Temp. Capt. (Acting Major) Lewis Anderson, D.S.O., M.B., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) William Bennett, D.S.O., M.B., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) Francis Lyndon Bradish, D.S.O., Royal Army Medical Corps.
 Capt. Robert Burgess, D.S.O., M.C., Royal Army Medical Corps (Territorial Force).
 Major George Garnet Greer, M.C., Canadian Army Medical Corps.
 Temp. Capt. (Acting Major) Trevor Abbott Lawder, Royal Army Medical Corps.
 Col. Vernon Prynnue, D.S.O., F.R.C.S., Army Medical Service.

Capt. (Acting Major) Peter Hohn Ryan, M.C., M.B., Royal Army Medical Corps.
Col. Robert Percy Wright, C.M.G., D.S.O., Canadian Army Medical Corps.

Médaille Militaire.

26867 Serjt. Frederick Charles, 40th Field Ambulance, Royal Army Medical Corps (Leicester).

Médaille des Epidemies (en Vermeil).

545655 Cpl. Walter Henry Lewis, 1/2nd London Sanitary Company, Royal Army Medical Corps (Territorial Force) (Wembley, Middlesex).

Médaille des Epidemies (en Argent).

464002 Cpl. (Acting Serjt.) John Ackland, 1/1st Wessex Divisional Sanitary Section, Royal Army Medical Corps (Braunton, North Devon).

473201 Qmr.-Serjt. William John Leach, 2/1st (East Anglian) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Newmarket).

Medaille de l'Assistance Publique (en Argent).

Capt. John Kennedy Gaunt, M.B., Royal Army Medical Corps.

Temp. Capt. Vivian Gray-Maitland, Royal Army Medical Corps.

Temp. Capt. Allan Douglas Low, Royal Army Medical Corps.

Temp. Capt. Walter Justice Paramore, Royal Army Medical Corps.

Temp. Capt. Robert Thomson, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Joseph Hugh Ward, D.S.O., M.C., M.B., Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

Ordre de Leopold.

Commandeur Lieut.-Gen. Sir Thomas Herbert John Chapman Goodwin, K.C.B., C.M.G., D.S.O.

Officier Brevet-Col. Sir Edward Scott Worthington, Kt., K.C.V.O., C.M.G., Royal Army Medical Corps.

Order de la Couronne.

Officier Major (Acting Lieut.-Col.) Thomas Bettsworth Moriarty, D.S.O., Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.

Order of St. Sava, 5th Class.

Capt. Fleet Floyd Strother Smith, M.B., Indian Medical Service.

Silver Medal for Zealous Service.

105438 Pte. (Acting Cpl.) Stuart Harry Douglas George, Royal Army Medical Corps (Tufnell Park, N.).

Cross of Mercy.

Capt. (Temp. Lieut.-Col.) Sir Thomas Crisp English, K.C.M.G., M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force), attached Royal Army Medical Corps.

23208 Pte. Joseph Norman Greaves, Royal Army Medical Corps (North Seaton).

60069 Pte. George Smith, Royal Army Medical Corps (Pilsley, Chesterfield).

War Office,

June 19, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign :—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS PRESENTED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Croix de Guerre.

Col. John Donald Alexander, D.S.O., M.B.

Brevet Lieut.-Col. (Temp. Lieut.-Col.) Elliott Beverly Bird, D.S.O., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Arthur Joseph Blake, M.C., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Arthur William Stark Christie, M.B., F.R.C.S., Royal Army Medical Corps.

Brevet Col. (Temp. Col.) Henry Edward Manning Douglas, V.C., C.M.G., D.S.O., Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) William Ross Gardner, D.S.O., M.B., Royal Army Medical Corps (Special Reserve).

Capt. Charles Frederick Hacker, M.C., M.B., Army Medical Corps.

Col. Wilfrid Edward Hudleston, C.M.G., D.S.O.

Capt. William John Knight, M.C., M.D., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) Langford Newman Lloyd, C.M.G., D.S.O., Royal Army Medical Corps.

Qmr. and Capt. Harry Miller, Royal Army Medical Corps.

Temp. Capt. James Carter Ogilvie, M.C., M.B., Royal Army Medical Corps, attached Border Regiment.

Major (Acting Lieut.-Col.) Donald de Courcey O'Grady, Royal Army Medical Corps.

Qmr. and Lieut. William Wilfred Parnell, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Edward Phillips, M.C., M.B., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) Horace Sampson Roch, C.M.G., D.S.O., Royal Army Medical Corps.

Temp. Capt. (Acting Lieut.-Col.) Lawrence Drew Shaw, D.S.O., M.B., Royal Army Medical Corps.

Capt. (Acting Major) John Rollo Noel Warburton, M.C., Royal Army Medical Service (Special Reserve).

41261 Serjt. Alexander Syson Bell, 108th Field Ambulance, Royal Army Medical Corps (Belfast).

22437 Pte. Sydney Horace Cox, 98th Field Ambulance, Royal Army Medical Corps (Enfield).

301239 Pte. Gordon Cruickshank, M.M., Royal Army Medical Corps, 89th Highland Field Ambulance (Territorial Force) (Aberdeen).

81270 Lance-Cpl. Cecil Franks, 97th Field Ambulance, Royal Army Medical Corps (Blidworth).

35272 Pte. William Gray, 105th Field Ambulance, Royal Army Medical Corps.

350290 Cpl. (Acting Serjt.) Albert Holden, 2/1st Field Ambulance (East Lincs.) Territorial Force, Royal Army Medical Corps (Bolton, Lincs.).

69063 Serjt. John Harry Jones, 95th Field Ambulance, Royal Army Medical Corps (Wrexham).

66936 Pte. Percy Llewellyn, 139th Field Ambulance, Royal Army Medical Corps (Birmingham).

65765 Pte. (Acting Lance-Serjt.) James Peat, 102nd Field Ambulance, Royal Army Medical Corps (Epsom).

38368 Serjt.-Major Ellis Ratcliffe, D.C.M., 138th Field Ambulance, Royal Army Medical Corps (Lees, near Keighley).

66919 Cpl. (Acting Serjt.) Ernest Albert Snelling, 140th Field Ambulance, Royal Army Medical Corps (Torquay).

528078 Pte. (Acting Cpl.) Selwyn Stott, 1st London Sanitary Company, Royal Army Medical Corps (Territorial Force) (Halifax).

30147 Qmr.-Serjt. (Acting Serjt.-Major) Charles Sumners, 106th Field Ambulance, Royal Army Medical Corps (Horndean).

400108 Serjt. Charles Reginald Tattersall, 43rd Field Ambulance, Royal Army Medical Corps (Territorial Force) (Driffield, East Yorkshire).

31089 Pte. John Richard West, 42nd Field Ambulance, Royal Army Medical Corps (Filgrave).

31816 Serjt. (Acting Qmr.-Serjt.) Bernard Wilson, 29th Field Ambulance, Royal Army Medical Corps (Cottingham).

July 3, 1919.

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for bravery in the Field to the undermentioned Warrant Officers, Non-Commissioned Officers and Men:—

ROYAL ARMY MEDICAL CORPS.

104301 Pte. D. G. Coomber, 101st Field Ambulance (Worthing) (Egypt).

32315 Pte. R. A. Gibbs, 30th Field Ambulance (Langrish) (Egypt).

CANADIAN FORCE.

530506 Pte. W. S. Antliff, No. 9 Field Ambulance, Canadian Army Medical Corps.

536065 Pte. T. Armitstead, 13th Field Ambulance, Canadian Army Medical Corps.

26669 Cpl. W. E. Baker, No. 1 Field Ambulance, Canadian Army Medical Corps.

530099 Pte. H. J. Black, No. 8 Field Ambulance, Canadian Army Medical Corps.

522769 Pte. J. E. Bowden, 8th Field Ambulance, Canadian Army Medical Corps.

529520 Lance-Serjt. J. T. Bowie, 10th Field Ambulance, Canadian Army Medical Corps.

529534 Cpl. W. Cairnie, 10th Field Ambulance, Canadian Army Medical Corps.

33307 Serjt. W. J. Campbell, 3rd Field Ambulance, Canadian Army Medical Corps.
 529533 Staff-Serjt. G. F. Carter, 10th Field Ambulance, Canadian Army Medical Corps.
 524660 Pte. L. F. Celle, 13th Field Ambulance, Canadian Army Medical Corps.
 530104 Cpl. F. E. Clements, 8th Field Ambulance, Canadian Army Medical Corps.
 530108 Pte. A. M. Creighton, 8th Field Ambulance, Canadian Army Medical Corps.
 524873 Pte. T. E. Dalton, 5th Field Ambulance, Canadian Army Medical Corps.
 532152 Staff-Serjt. G. C. G. Dodds, 12th Field Ambulance, Canadian Army Medical Corps.

33322 Staff-Serjt. J. H. Dyer, Canadian Army Medical Corps.
 50568 Pte. G. H. Ford, 8th Field Ambulance, Canadian Army Medical Corps.
 521060 Pte. J. A. Fraser, 1st Field Ambulance, Canadian Army Medical Corps.
 524929 Pte. S. Fulton, 9th Field Ambulance, Canadian Army Medical Corps.
 530541 Lance-Cpl. C. A. Godfrey, 9th Field Ambulance, Canadian Army Medical Corps.
 523613 Pte. R. P. Grimes, 10th Field Ambulance, Canadian Army Medical Corps.
 529576 Serjt. H. Hall, 10th Field Ambulance, Canadian Army Medical Corps.
 1250517 Pte. G. A. Hamilton, 6th Field Ambulance, Canadian Army Medical Corps.
 1311 Cpl. G. W. Hogarth, 4th Field Ambulance, Canadian Army Medical Corps.
 530088 Serjt. A. C. Holding, 4th Battalion, Canadian Army Medical Corps.
 529066 Pte. H. A. Holmes, 9th Field Ambulance, Canadian Army Medical Corps.
 2024 Cpl. R. Inniss, 6th Field Ambulance, Canadian Army Medical Corps.
 524551 Pte. J. Keech, 8th Field Ambulance, Canadian Army Medical Corps.
 1331 Pte. E. Livingstone, 4th Field Ambulance, Canadian Army Medical Corps.
 530050 Pte. H. W. Lovell, 8th Field Ambulance, Canadian Army Medical Corps.
 210829 Pte. F. Lowe, 4th Field Ambulance, Canadian Army Medical Corps.
 700526 Pte. S. G. Lowes, 12th Field Ambulance, Canadian Army Medical Corps.
 524558 Pte. G. F. MacKenzie, 9th Field Ambulance, Canadian Army Medical Corps.
 530580 Pte. D. MacKinnon, 9th Field Ambulance, Canadian Army Medical Corps.
 529614 Serjt. J. McAndrew, 10th Field Ambulance, Canadian Army Medical Corps.
 530581 Pte. L. G. McLanchlin, 9th Field Ambulance, Canadian Army Medical Corps.
 530137 Cpl. W. S. Maguire, 8th Field Ambulance, Canadian Army Medical Corps.
 33405 Serjt. T. Main, 2nd Field Ambulance, Canadian Army Medical Corps.
 530687 Pte. J. Matthews, 9th Field Ambulance, Canadian Army Medical Corps.
 529602 Serjt. M. A. Millar, 10th Field Ambulance, Canadian Army Medical Corps.
 522883 Cpl. R. T. Millner, 3rd Field Ambulance, Canadian Army Medical Corps.
 1366 Lance-Cpl. W. M. Morris, 4th Field Ambulance, Canadian Army Medical Corps.
 1371 Pte. A. W. Neal, 4th Field Ambulance, Canadian Army Medical Corps.
 155070 Lance-Cpl. J. Ogilvie, 9th Field Ambulance, Canadian Army Medical Corps.
 53069 Lance-Serjt. G. Patience, 8th Field Ambulance, Canadian Army Medical Corps.
 529060 Pte. R. R. Penhale, 9th Field Ambulance, Canadian Army Medical Corps.
 535475 Pte. C. S. Reid, 9th Field Ambulance, Canadian Army Medical Corps.
 400455 Serjt. H. Sawyer, 9th Field Ambulance, Canadian Army Medical Corps.
 475324 Pte. R. B. Simms, 10th Field Ambulance, Canadian Army Medical Corps.
 524587 Pte. J. Spurge, 8th Field Ambulance, Canadian Army Medical Corps.
 228219 Pte. T. S. Staton, 1st Field Ambulance, Canadian Army Medical Corps.
 2132 Lance-Cpl. T. Swift, 6th Field Ambulance, Canadian Army Medical Corps.
 86535 Cpl. R. Taylor, 10th Field Ambulance, Canadian Army Medical Corps.
 1733 Pte. A. Turner, 10th Field Ambulance, Canadian Army Medical Corps.
 32908 Pte. W. Waring, 1st Field Ambulance, Canadian Army Medical Corps.
 530691 Pte. A. J. Waterman, 9th Field Ambulance, Canadian Army Medical Corps.
 529054 Pte. H. Woolnough, 8th Field Ambulance, Canadian Army Medical Corps.

AUSTRALIAN IMPERIAL FORCE.

3865 Lance-Serjt. E. Thorpe, 4th L.H. Field Ambulance, Australian Army Medical Corps (Egypt).
 2830 Pte. W. P. Whittlesea, 3rd L.H. Field Ambulance, Australian Army Medical Corps (Egypt).

SOUTH AFRICAN FORCE.

891 Cpl. G. Paterson, 3rd Field Ambulance, South African Army Medical Corps (East Africa).

AMENDMENTS.

The following are the correct descriptions of the undermentioned Warrant Officers, Non-commissioned Officers and Men whose names have recently appeared in the *London Gazette* for the award of the Military and Meritorious Service Medal:—

Military Medal.

465037 Cpl. J. P. Green, 4th Field Ambulance, Royal Army Medical Corps. (Gazetted as Carnell.)

Meritorious Service Medal.

(*London Gazette*, dated December 17, 1917.)

40449 Serjt.-Major A. E. Blagrove, Royal Army Medical Corps. (Gazetted as Blagrove.)

War Office.

July 12, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE UNITED STATES OF AMERICA.

The American Distinguished Service Medal.

Major-Gen. (Temp. Lieut.-Gen.) Sir Charles Henry Burtchaell, K.C.B., C.M.G., M.B. K.H.S.

War Office,

July 14, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Légion d'Honneur.

Officier Major-Gen. Menus William O'Keefe, K.C.M.G., C.B., M.D.

Croix de Guerre.

Major-Gen. Harry Neville Thompson, C.B., C.M.G., D.S.O., M.B.

Croix de Guerre avec Etoile en Vermeil.

301239 Pte. Gordon Cruickshank, 89th Field Ambulance, Royal Army Medical Corps (Aberdeen).

Médaille Militaire.

83767 Regimental Serjt.-Major Thomas William Comfort, Royal Army Medical Corps (Kingston-on-Thames).

7296 Serjt. William Alfred Percival, 8th Field Ambulance, Royal Army Medical Corps (North Kensington).

Médaille d'Honneur avec Glaives en Vermeil.

36588 Serjt.-Major Thomas Simpson, 34th Field Ambulance, Royal Army Medical Corps (Stourbridge).

Médaille d'Honneur avec Glaives en Argent.

31860 Serjt. Gustavus Frankel, 8th Field Ambulance, Royal Army Medical Corps (Spitalfields, E.).

58655 Cpl. (Acting Serjt.) Frank Turner, Royal Army Medical Corps (Whitby).

33415 Pte. Alfred George Burke, 35th Field Ambulance, Royal Army Medical Corps (Sheffield).

72639 Serjt. Harold Arthur Christian, Royal Army Medical Corps (Great Yarmouth).

71738 Lance-Cpl. Thomas Hacking, 137th Field Ambulance, Royal Army Medical Corps (East Manchester).

1701951 Pte. William Kay, 23rd Field Ambulance, Royal Army Medical Corps (Darwen, Lancs.).

90328 Pte. George Mackenzie, Royal Army Medical Corps (Wick).

545165 Pte. William Newman, 2nd London Sanitary Company, Royal Army Medical Corps (Streatham).

75228 Pte. Richard Wilkinson Turnbull, 73rd Field Ambulance, Royal Army Medical Corps (Usworth).

53207 Pte. Ernest Frederick Gordon Wallace, Royal Army Medical Corps (Chichester).

War Office,

July 15, 1919.

His Majesty the King has been graciously pleased to approve of the following immediate awards for conspicuous gallantry and devotion to duty in North Russia, conferred by Major-Gen. C. C. M. Maynard, C.B., C.M.G., D.S.O., in pursuance of the powers vested in him by His Majesty:—

AWARDED A BAR TO THE MILITARY CROSS.

Capt. Frederick George Flood, M.C., M.B., Royal Army Medical Corps (Special Reserve).

During operations at Vigezere and Petrovaki Yam, on March 18, 1919, he dressed wounded under heavy machine-gun and rifle fire, and under most trying conditions saved many lives. After the action he successfully evacuated all the wounded over sixty versts of most difficult country without losing a case. He showed great gallantry and marked ability and devotion to duty. (M.C. gazetted June 18, 1917.)

AMENDMENT TO THE *London Gazette*, DATED JANUARY 1, 1919.

K.C.B.

Page 81. For Major-Gen. George Joseph Hamilton Evatt, C.B., M.D., read Major-Gen. George Joseph Hamilton Evatt, C.B., M.D. (Hon. Col., Home Counties Division, Royal Army Medical Corps, Territorial Force), retired pay, Army Medical Service.

AMENDMENT TO SUPPLEMENT TO *London Gazette*, DATED JUNE 9, 1919.

(To be Lieut.-Colonel.)

Page 7009. For Qmr. and Major H. Wooley, Royal Army Medical Corps, read Qmr. and Major H. Woolley, Royal Army Medical Corps.

July 15, 1919.

CORRECTIONS.

The following are the correct descriptions of Officers whose names appeared in the *Gazettes* indicated, in connexion with the grant of decorations or Mentions in *Dispatches*:—

Capt. James Henry Cooke, M.B.E., M.B. (Royal Army Medical Corps, Egypt) (*Gazette* No. 31098, January 1, 1919).

ARMY MEDICAL SERVICE.

Col. S. Guise Moores, C.B., C.M.G., relinquishes the temporary rank of Major-Gen. on ceasing to be employed as D.M.S. of an Army, dated April 10, 1919.

Col. Sir W. H. Horrocks, K.C.M.G., C.B., M.B., retired pay, to be Temp. Dir. of Hygiene at the War Office, and to be Temp. Brig.-Gen. whilst so employed, dated June 1, 1919.

Lieut.-Col. D. Harvey, C.M.G., C.B.E., M.D., Royal Army Medical Corps, to be Deputy Director of Pathology at the War Office, and to be Temp. Col. whilst so employed, dated June 1, 1919.

Temp. Lieut. Charles Alexander Whitfield, M.C., to be Lieut., dated September 5, 1918, but not to reckon for pay or allowances prior to May 1, 1919, with precedence next below J. C. Coutts.

Major Phillip C. T. Davy, C.M.G., is seconded for serving under the Egyptian Government, dated May 1, 1919.

Major and Brevet Lieut.-Col. W. C. Smales, D.S.O., Royal Army Medical Corps, from Deputy Assistant Director-General, to be Assistant Director of Hygiene at the War Office, dated June 1, 1919.

Major-Gen. Sir W. B. Leishman, K.C.M.G., C.B., F.R.S., M.B., F.R.C.P., F.R.F.P.S., K.H.P., to be Director of Pathology at the War Office, dated June 1, 1919.

Major A. C. H. Gray, O.B.E., M.B., Royal Army Medical Corps, to be Assistant Director of Pathology at the War Office, and to be Temp. Lieut.-Col. whilst so employed, dated June 10, 1919.

Major and Brevet Lieut.-Col. W. C. Smales, D.S.O., Royal Army Medical Corps, from Deputy Assistant Director-General, to be Assistant Director of Hygiene at the War Office, and to be Temp. Lieut.-Col. whilst so employed, Dated June 1, 1919. (Substituted for the notification in the *Gazette* of June 30, 1919.)

Capt. Henry Bryan Frost Dixon, M.C., M.B., from Royal Army Medical Corps (Territorial Force), to be Captain, dated February 5, 1918, but not to reckon for pay or allowances prior to May 1, 1919, with precedence next below R. E. Barnsley.

Capt. S. S. Dykes, M.B., to be Acting Major whilst commanding troops on a Hospital Ship, from September 11, 1918 to April 24, 1919.

Capt. (Acting Major) G. G. Collet to draw the pay and allowances of his acting rank from November 20, 1918, to March 25, 1919, when he relinquishes the acting rank of Major.

Capt. H. F. Joynt, M.B., March 22, 1919.

Capt. (Acting Major) A. G. Wells, D.S.O., relinquishes the acting rank of Lieut.-Col., dated April 11, 1919, and is granted the acting rank of Major.

Capt. L. G. Bourdillon, D.S.O., M.C., is seconded for service with the Egyptian Army, dated April 24, 1919.

Capt. H. H. Leeson, M.C., on ceasing to command a Field Ambulance relinquish the acting rank of Lieut.-Col., dated June 12, 1919.

Major L. V. Thurston, D.S.O., on ceasing to command a Medical Unit relinquish the acting rank of Lieut.-Col., dated June 23, 1919.

Capt. (Acting Major) R. B. Phillipps to draw the pay and allowances of his acting rank from April 28, 1919.

Capt. (Acting Major) W. W. Treves, M.B., F.R.C.S., retires, receiving a gratuity, dated June 19, 1919, and is granted the rank of Major.

The notification regarding Capt. E. Catford, in the *Gazette* of January 31, 1919, is cancelled.

The notification regarding Major G. De la Cour, M.B., in the *Gazette* of March 22, 1919, is cancelled.

The notification regarding the appointment of Charles Henry Thorne as Qmr. and Hon. Lieut. in the *Gazette* of April 5, 1919, is cancelled.

The notification in the *Gazette* of April 26, 1917, regarding Lieut.-Col. F. F. Carroll, D.S.O., is cancelled.

The notification in the *Gazette* of May 9, 1919, regarding Capt. (Acting Lieut.-Col.) E. T. Burke, D.S.O., M.B., is cancelled, dated June 5, 1919.

The notification in the *Gazette* of May 9, 1919, regarding Capt. Donald McIntyre, M.B.E., M.B., is cancelled, dated July 19, 1919.

The notification of the relinquishment of the acting rank of Lieut.-Col. by Major P. T. C. Davy, C.M.G., in the *Gazette* of June 12, 1919, is cancelled.

The undermentioned to be seconded for service under the Civil Administration of Mesopotamia :—

Dated April 1, 1919.—Capt. and Brevet Major A. G. J. MacIlwaine, C.I.E.; Capt. and Brevet Major L. Dunbar; Capt. T. J. Halliman; Capt. P. A. With; Capt. O. D. Jarvis, M.B.

The undermentioned Colonels retire on retired pay :—

Dated May 22, 1919.—Col. Richard Hugh Penton, D.S.O.

Dated June 1, 1919.—Frederick James Morgan, C.M.G.; Robert Lockhart Ross Macleod, C.B., M.B.; Nicholas Charles Ferguson, C.M.G.

Dated June 15, 1919.—Col. Sydney G. Allen.

Dated June 21, 1919.—Col. Frederick J. Morgan, C.M.G.

Dated June 28, 1919.—Col. James Fallon.

Dated July 7, 1919.—Col. Thomas Du B. Whaite, C.B., C.M.G.

The undermentioned Lieutenant-Colonels retire on retired pay :—

Dated April 27, 1919.—Lieut.-Col. George Arthur Theodore Bray, D.S.O.

Dated June 21, 1919.—Lieut.-Col. George E. F. Stammers, O.B.E.

Dated July 9, 1919.—Lieut.-Col. Septimus H. Fairrie, M.B.

The undermentioned relinquish the acting rank of Colonel on reposting :—

Dated December 24, 1918.—Lieut.-Col. Fitz G. G. FitzGerald, D.S.O.

Dated February 28, 1919.—Capt. and Brevet Major W. G. Wright, D.S.O.

Dated March 13, 1919.—Major C. Bramhall; Major W. Egan, D.S.O., M.B.

Dated March 16, 1919.—Major J. J. O'Keefe; Major R. N. Woodley, D.S.O.

Dated March 17, 1919.—Lieut.-Col. H. M. Morton, D.S.O., M.B.; Capt. W. J. Dunn, M.B.

Dated March 18, 1919.—Capt. J. W. C. Stubbs, M.C., M.B.; Capt. H. G. Monteith, D.S.O.

Dated March 19, 1919.—Capt. E. W. Vaughan, M.C., M.B.; Major and Brevet Lieut.-Col. J. G. Bell, D.S.O., M.B.; Major T. E. Harty, D.S.O.

Dated March 20, 1919.—Major J. M. M. Crawford, F.R.C.S.I.

Dated March 22, 1919.—Lieut.-Col. and Brevet Col. R. S. Hannay, C.M.G., D.S.O.

Dated March 26, 1919.—Lieut.-Col. H. G. Martin, C.M.G.

Dated March 27, 1919.—Capt. R. B. Price, D.S.O., M.B.

Dated —March 30, 1919.—Capt. F. Worthington, D.S.O., O.B.E., M.B.

- Dated March 31, 1919.—Capt. E. Phillips, M.C., M.B.; Capt. R. Hemphill, D.S.O., M.B.
 Dated April 1, 1919.—Major E. C. Phelan, D.S.O., M.C., M.B.; Capt. C. Helm, D.S.O., M.C.
 Dated April 4, 1919.—Major and Brevet Lieut.-Col. C. W. Holden, D.S.O. (Substituted for the notification regarding this officer in the *Gazette* of June 5, 1919.)
 Dated April 7, 1919.—Capt. F. C. Davidson, M.C., M.B.
 Dated April 12, 1919.—Capt. J. H. Fletcher, D.S.O., M.C.
 Dated April 13, 1919.—Major D. P. Watson, D.S.O., M.B.
 Dated April 14, 1919.—Lieut.-Col. F. McLennan, D.S.O., M.B.
 Dated April 15, 1919.—Capt. J. D. Bowie, D.S.O., M.B.; Capt. and Brevet Major F. T. Dowling, M.B.
 Dated April 18, 1919.—Capt. C. M. Drew, M.B.
 Dated April 19, 1919.—Lieut.-Col. H. C. R. Hime, D.S.O., M.B.
 Dated April 20, 1919.—Capt. H. C. D. Rankin, M.B.
 Dated April 22, 1919.—Major G. F. Rudkin, D.S.O.
 Dated April 23, 1919.—Major B. Johnson, D.S.O., M.B.; Major T. Henry Scott, D.S.O., M.C., M.B.
 Dated May 13, 1919.—Major C. G. Thomson, D.S.O.
 Dated May 20, 1919.—Capt. L. F. K. Way.
 Dated June 6, 1919.—Major T. S. Blackwell.
 The undermentioned relinquish the acting rank of Lieut.-Colonel on reposting :—
 Dated July 10, 1918.—Major P. C. T. Davy, C.M.G., M.B.
 Dated October 17, 1918.—Major R. C. Wilson, M.B.
 Dated February 28, 1919.—Capt. R. R. Thompson, M.C.
 Dated March 1, 1919.—Capt. T. A. Weston, M.B.
 Dated March 3, 1919.—Major W. C. Nimmo; Major W. J. Wateers.
 Dated March 4, 1919.—Major D. L. Harding, D.S.O., F.R.C.S.I.
 Dated March 12, 1919.—Capt. and Brevet Major J. A. Manifold, D.S.O., M.B.; Major W. J. Weston, D.S.O.; Major H. H. A. Emerson, D.S.O., M.B.
 Dated March 22, 1919.—Major R. E. U. Newman, M.C., M.B.
 Dated April 11, 1919.—Major R. F. M. Fawcett, D.S.O.
 Dated April 13, 1919.—Capt. H. A. Harbison, M.C., M.B.
 Dated April 19, 1919.—Capt. C. Clarke, D.S.O., M.B.; Capt. G. P. Taylor, D.S.O., M.C., M.B.
 Dated April 24, 1919.—Major E. M. O'Neill, D.S.O., M.B.
 Dated April 25, 1919.—Capt. J. R. Hill, M.B.
 Dated April 30, 1919.—Major Phillip C. T. Davy, C.M.G.
 Dated May 11, 1919.—Capt. G. F. Allison.
 Dated May 14, 1919.—Major C. T. Edmunds, D.S.O.; Capt. F. R. Laing, M.B.
 Dated May 26, 1919.—Capt. A. J. Hickey, M.C.
 Dated June 2, 1919.—Major W. W. Boyce, D.S.O.
 The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel on ceasing to be specially employed :—
 Dated March 17, 1919.—E. W. W. Cochrane, D.S.O., M.B.
 Dated April 12, 1919.—L. N. Lloyd, C.M.G., D.S.O.
 The undermentioned to be Acting Colonels whilst specially employed :—
 Dated April 11, 1919.—Lieut.-Col. J. A. Hartigan, C.M.G., D.S.O., M.B.
 Dated June 1, 1919.—Lieut.-Col. Sydney G. Butler, D.S.O.
 The undermentioned relinquish the temporary rank of Lieutenant-Colonel on reposting :—
 Dated April 3, 1919.—Major and Brevet Lieut.-Col. J. A. Anderson, M.B.
 Dated May 21, 1919.—Major F. C. Sampson, D.S.O., M.B.
 Dated June 10, 1919.—Major and Brevet Lieut.-Col. M. G. Winder, D.S.O.
 The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel on reposting :—
 Dated April 8, 1919.—F. J. Brakenridge, C.M.G.
 Dated April 14, 1919.—J. S. Gallie, C.M.G., D.S.O.; G. J. Houghton, D.S.O.
 Dated May 5, 1919.—H. E. M. Douglas, V.C., C.M.G., D.S.O.
 Dated May 8, 1919.—W. Bennett, D.S.O., M.B.
 The undermentioned relinquish the acting rank of Lieutenant-Colonel on reposting :—
 Dated April 4, 1919.—Major and Brevet Lieut.-Col. C. W. Holden, D.S.O.
 The undermentioned relinquish the acting rank of Lieutenant-Colonel on ceasing to be specially employed :—
 Dated May 25, 1919.—Major J. E. Carter, M.B.
 Dated June 27, 1919.—Major A. E. S. Irvine, D.S.O.
 The undermentioned to be Acting Lieutenant-Colonels whilst specially employed :—
 Dated March 29, 1919.—Major and Brevet Lieut.-Col. W. Benson, D.S.O., M.B.

Dated April 14, 1919.—Major W. J. Weston, D.S.O.

Dated April 19, 1919.—Major E. C. Phelan, D.S.O., M.C., M.B.

Dated April 23, 1919.—Major R. B. Hole, M.B.

Dated April 29, 1919.—Major E. B. Booth, D.S.O., M.D.

Dated June 1, 1919.—Capt. R. M. Dickson, M.D.

Dated June 8, 1919.—Major E. E. Parkes, M.B.

The undermentioned to be Acting Lieutenant-Colonels whilst commanding Medical Units :—

Dated October 14, 1918.—Major R. N. Hunt, D.S.O., M.B., to be Acting Lieut.-Col. whilst commanding a Medical Unit. (Substituted for the notification regarding this officer in the *Gazette* of May 27, 1919.)

Dated October 18, 1918.—Capt. (Acting Major) T. A. Weston, M.B.

Dated December 29, 1918.—Capt. (Acting Major) W. W. MacNaught, M.C., M.B.

Dated January 31 to April 21, 1919.—Major J. A. W. Webster.

Dated February 21, 1919.—Major N. E. Dunkerton, D.S.O.

Dated April 4, 1919.—Major and Brevet Lieut.-Col. C. W. Holden, D.S.O.

Dated June 21, 1919.—Major E. M. O'Neill, D.S.O., M.B.; Major A. M. Rose, D.S.O., M.B.

The undermentioned Lieutenants (Temporary Captains) to be Captains :—

Dated May 1, 1919.—W. H. A. D. Sutton.

Dated May 5, 1919.—W. D. Newland, M.C.

Dated May 8, 1919.—L. S. C. Roche, M.C.

Dated May 14, 1919.—C. L. Emmerson.

Dated May 16, 1919.—F. A. R. Hacker.

Dated June 1, 1919.—G. D. Gripper.

Dated June 23, 1919.—G. T. Baker, M.C.

Dated June 28, 1919.—(Acting Major) H. C. Watson, M.C., M.B., and retains his acting rank.

Dated June 29, 1919.—G. T. Gimlitte, M.B.

Dated June 29, 1919.—G. T. Gimlette, M.B.

The undermentioned to be Acting Majors whilst specially employed :—

Dated January 20, 1919.—Capt. W. J. Tobin.

Dated March 19, 1919.—Capt. E. G. S. Cane.

Dated June 1, 1919.—Capt. N. V. Lothian, M.C., M.B.

Dated June 13, 1919.—E. A. Strachan, M.B.

The undermentioned relinquish the acting rank of Major on reposting :—

Dated March 3, 1919.—Capt. R. A. Mansell, M.B.E., M.B.

Dated March 24, 1919.—Capt. J. K. Gaunt, M.B.

Dated April 11, 1919.—Capt. W. V. Corbett.

Dated April 17, 1919.—Capt. J. la F. Lauder, D.S.O., M.C.

Dated May 1, 1919.—Capt. J. Vallance, M.B.

The undermentioned to be Acting Majors :—

Dated October 31, 1918.—Capt. A. E. Richmond.

Dated January 8, 1919.—Capt. T. J. L. Thompson, M.C., M.B.

Dated April 7, 1919.—Capt. K. P. Mackenzie, M.B.

Dated April 20, 1919.—Capt. A. L. Foster.

Dated April 22, 1919.—Capt. C. E. L. Harding.

Dated June 1, 1919.—Capt. and Brevet Major J. D. Kidd, M.C., M.B.

Dated June 14, 1918.—Capt. W. T. Graham, M.B.

The undermentioned relinquish the acting rank of Major :—

Dated November 8, 1918.—Capt. and Brevet Major S. W. Kyle, M.B.

Dated February 8, 1919.—Capt. F. R. S. Shaw, M.C., M.B.

Dated February 24, 1919.—Capt. D. H. C. McArthur, M.D.; Capt. A. L. Stevenson, M.B.

Dated February 26, 1919.—Capt. and Brevet Major A. Shepherd, M.B.

Dated March 4, 1919.—Capt. R. H. Williams.

Dated March 5, 1919.—Capt. J. H. Baird; Capt. T. K. Boney, M.D.

Dated March 6, 1919.—Capt. A. P. O'Connor, M.C., M.B.

Dated March 11, 1919.—Capt. W. J. Knight, M.C., M.D.

Dated March 16, 1919.—Capt. R. C. Aitchison, M.B.

Dated March 17, 1919.—Capt. E. G. H. Cowen, M.B.

Dated March 18, 1919.—Capt. R. W. Vint, M.B.

Dated March 19, 1919.—Capt. A. L. Stevenson, M.B.

Dated March 20, 1919.—Capt. C. Russell, M.C., M.B.

Dated March 28, 1919.—(Temp. Capt.) G. E. Spicer, M.C.

Dated March 30, 1919.—Capt. G. P. Kidd, D.S.O., M.C.; Capt. F. C. Chandler, M.C., M.B.

Dated March 31, 1919.—Capt. T. D. Inch, O.B.E., M.C., M.B.

The undermentioned relinquish the acting rank of Major :—

Dated April 3, 1919.—Capt. T. J. L. Thompson, M.C., M.B.

Dated April 5, 1919.—Capt. and Brevet Major F. C. Cowtan; Capt. J. A. Renshaw.

Dated April 6, 1919.—Capt. and Brevet Major W. L. Webster, M.B.

Dated April 10, 1919.—Capt. R. A. Hepple, M.C., M.B.

Dated April 12, 1919.—Capt. E. B. Marsh, M.C., M.B.; Capt. R. Ellis, M.C., M.B.

Dated April 17, 1919.—Capt. N. Cantlie, M.C., M.B.

Dated May 16, 1919.—Capt. C. M. Rigby.

Dated May 26, 1919.—Capt. F. R. H. Mollan.

Dated June 12, 1919.—Capt. C. T. V. Benson.

The undermentioned Captains resign their commands :—

Dated June 6th, 1919.—Capt. C. J. O'Reilly, M.C., M.D.

Dated June 11, 1919.—Capt. A. L. Urquhart, O.B.E., M.B.

Dated June 12, 1919.—Capt. T. D. Inch, O.B.E., M.C., M.B.; Capt. C. J. D. May.

Dated June 19, 1919.—Capt. J. E. Rusby, M.C.

Dated July 1, 1919.—Capt. J. A. Andrews, M.C., M.B.; Capt. J. A. W. Ebdon, M.B.

Dated July 18, 1919.—Capt. H. A. Harbison, M.C., M.B.

The undermentioned to be Lieutenants, and to be Temporary Captains, but not to reckon for pay or allowances prior to June 1, 1919, with precedence as stated :—

Dated May 22, 1916.—Temp. Capt. Herbert John Davidson, M.C., M.B., next below P. G. Russell.

Dated October 2, 1916.—Capt. Gerald Hugh Barry, M.B., from Special Reserve, next below G. G. Drummond.

Dated January 1, 1917.—Capt. Thomas Stanton, M.B., from Special Reserve, next below J. P. Macnamara.

Dated June 1, 1917.—Temp. Capt. Thomas Hill Twigg, M.B., next below J. M. Morrison.

The undermentioned to be Lieutenants and to be Temporary Captains, but not to reckon for pay or allowances prior to July 1, 1919, with precedence as stated :—

Dated February 4, 1916.—Temp. Capt. Charles Hugh Colclough Byrne, next below T. C. Bowie.

Dated August 25, 1916.—Temp. Capt. Arthur James Bado, next below B. J. Daunt.

Dated July 5, 1917.—Capt. Pat Adam Stewart, M.B., from Special Reserve, next below K. Masson.

Dated July 26, 1917.—Temp. Capt. George William Bernard Shaw, M.B., next below J. C. Collins.

Dated April 8, 1918.—Capt. Malcolm Clark Paterson, M.C., M.B., from Special Reserve, next below G. E. MacAlevey.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to May 1, 1919, with precedence as stated :—

Dated January 19, 1919.—Capt. (Acting Major) Charles Henry Brennan, M.C., from Special Reserve, next below A. J. Beveridge, and to retain his acting rank.

Dated February 27, 1918.—Temp. Capt. William Frier, M.B., next below R. W. Galloway.

Dated June 4, 1918.—Temp. Capt. Michael Patrick Power, M.C., next below W. E. Adam.

Dated February 6, 1918.—Capt. Sarsfield James Ambrose Hall Walshe, D.S.O., M.B., from Special Reserve, next below R. E. Barnsley; Capt. William Walker, M.C., M.B., from Special Reserve, next below R. J. Clausen.

Dated February 25, 1919.—Temp. Capt. Andrew William Palethorpe Todd, M.C., M.B., next below J. E. Rusby.

Dated March 19, 1918.—Capt. (Acting Major) George Allman Bridge, M.C., M.B., from Special Reserve, next below W. E. Tyndall, and to retain his acting rank.

Dated March 23, 1918.—Capt. Frank Sheppard Gillespie, M.B., from Special Reserve, next below H. G. Trayer.

Dated March 30, 1918.—Capt. (Acting Major) Joseph Andrew Lowther Wilson, M.B., from Special Reserve, next below W. W. McNaught, and to retain his acting rank.

Dated May 1, 1918.—Temp. Capt. Daniel McKelvey, M.C., M.B., next below T. F. Kennedy.

Dated May 11, 1918.—Capt. Bertrand Cecil Owens Sheridan, M.C., M.B., from Special Reserve, next below K. A. M. Tomory.

The undermentioned Temporary Captains to be Lieutenants and to be Temporary Captains, but not to reckon for pay or allowances prior to May 1, 1919, with precedence as stated :—

Dated December 28, 1915.—(Acting Major) Henry Currie Watson, M.C., M.B., next below G. T. Baker, and to retain his acting rank.

- Dated September 1, 1916.—Ailwyn Herbert Clarke, M.C., M.B., next below B. J. Daunt.
 Dated November 1, 1917.—Thomas Bousfield Herrick Tabuteau, next below A. R. Barlas.
 The undermentioned Captains, from Special Reserve, to be Lieutenants and to be Temporary Captains, but not to reckon for pay or allowances prior to May 1, 1919, with precedence as stated :—
 Dated August 28, 1916.—Hugh Moore Alexander, next below B. J. Daunt.
 Dated November 1, 1917.—(Acting Major) Douglas James Valentine, next below A. R. Barlas, and to retain his acting rank.
 The undermentioned to be Captains, but not to reckon for pay or allowances prior to June 1, 1919, with precedence as stated :—
 Dated February 10, 1918.—Temp. Capt. Cecil Beresford Hogg, M.B., next below L. G. Bourdillon.
 Dated March 16, 1918.—Temp. Capt. Ernest Edwin Holden, next below A. C. Jebb.
 Dated March 20, 1918.—Temp. Capt. William Moodie, M.D., next below D. W. John.
 Dated June 16, 1918.—Temp. Capt. Alexander Mearns, M.B., next below F. J. Hallinan.
 Dated July 15, 1918.—Capt. (Acting Major) Hugh Arthur Sandiford, M.C., M.B., from Territorial Force, next below F. Harris, and retains his acting rank.
 Dated August 10, 1918.—Temp. Capt. Frank Hamersley Woods, next below C. R. Dudgeon.
 Dated September 24, 1918.—Temp. Capt. Francis Albert L'Estrange, M.B., next below A. W. Raymond.
 The undermentioned to be Captains, but not to reckon for pay or allowances prior to July 1, 1919, with precedence as stated :—
 Dated March 30, 1918.—Capt. William Hern Cornelius, from Special Reserve, next below C. de W. Gibb.
 Dated June 2, 1918.—Temp. Capt. Reginald Hutchinson Lucas, M.C., next below W. E. Adam.
 Dated September 19, 1918.—Temp. Capt. Patrick Joseph Standish O'Grady, next below G. H. Haines.

At the Edinburgh University Graduation Ceremonial on July 10, the honorary degree of Doctor of Laws of the University was conferred on Major-Gen. Sir W. G. Macpherson, K.O.M.G., C.B.

OBITUARY.

CAPTAIN WILLIAM S. R. STEVEN, R.A.M.C.

CAPT. WILLIAM S. R. STEVEN, R.A.M.C., who died on July 1, 1919, at the Military Hospital, Devonport, was the youngest son of the late John Steven, of Bay View, Sligo, Ireland, and grandson of the late Capt. Caleb Robertson, 88th (Connaught Rangers), of Abbey View, Boyle, Ireland. A student of Queen's College, Belfast, he took the degrees of M.B., B.Ch., R.U.I. in 1909. After acting as Resident Clinical Assistant at the Townsend Street Maternity Hospital, Belfast, and as a Resident Surgeon and Physician at the Royal Victoria Hospital, Belfast, he entered the Royal Army Medical Corps as Lieutenant in January, 1911. He was appointed to the Eastern Command and eventually proceeded to India early in 1913, being employed as malarial expert at Karachi. He was gazetted to the rank of Captain in July, 1914.

For the first eighteen months of the late war he acted, with great credit to himself, as Radiologist to the Colaba War Hospital, Bombay; later he was employed in a similar capacity on a hospital ship plying between East Africa, Mesopotamia and India, for a period of close on two years.

He was invalided from India at the beginning of the present year, and was at the time of his death, which was due to appendicitis, commanding the Military Hospital, Eggbuchland, Plymouth.

The late Captain Steven was a man of charming personality, conspicuous ability, and the possessor of many friends, by whom his loss is greatly deplored. He was unmarried.

By his untimely death at the age of 34, the Royal Army Medical Corps loses the services of one of its most promising officers.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

Major, willing to exchange to go abroad this trooping season. Bottom of foreign service roster April, 1915. Write, stating terms, to "O.C.," 36 C.C.S., British Army of the Rhine.

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Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

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Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 324, Adastral House, Victoria Embankment, E.C. 4.

Communications have been received from Major W. Broughton-Alcock; Captain E. P. Wheeler.

The following publications have been received:—

British: The Journal of the Royal Army Service Corps, The Journal of State Medicine, Journal of the Royal United Service Institution of India, The Indian Medical Gazette, The Medical Journal of Australia, The Hospital, Agricultural Research Institute, Pasa, Transactions of the Society of Tropical Medicine and Hygiene, The Medical Press, St. Bartholomew's Hospital Journal, The Journal of Tropical Medicine and Hygiene, The British Journal of Tuberculosis, Guy's Hospital Gazette, Tropical Diseases Bulletin, The Royal Engineers' Journal, The Middlesex Hospital Journal, Journal of the Royal Naval Medical Service, Edinburgh Medical Journal, The St. Thomas's Hospital Gazette, The Medical Review, Abstracts of Bacteriology, Tropical Veterinary Bulletin, The Practitioner, The British Journal of Surgery, The Quarterly Journal of Medicine, The Outlook.

Foreign: Archives Medicales Belges, United States Public Health Service, L'Ospedale Maggiore, Office International d'Hygiène Publique, The Military Surgeon, Rivista de la Sanidad Militar, United States Department of Agriculture, Bulletin of the Johns Hopkins Hospital, Bulletin d, l'Institut Pasteur, Colonies et Marine, United States Naval Medical Bulletin, Giornale di Medicina Militare, The Journal of Infectious Diseases, Surgery, Gynecology and Obstetrics, Archives de l'Institut Pasteur de Treves, Le Caducée, Archives de Médecine et Pharmacie Navales, Norsk Tidsskrift for Militar Medicin.

MANAGER'S NOTICES.

The **JOURNAL OF THE ROYAL ARMY MEDICAL CORPS** is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

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The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

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25, ADASTRAL HOUSE, VICTORIA EMBANKMENT, E.C.4.

JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Corps News.

SEPTEMBER, 1919.

EXTRACTS FROM THE LONDON GAZETTE.

War Office,
July 10, 1919.

The following is a continuation of Sir D. Haig's dispatch of March 16, 1919, submitting names deserving of special mention:—

ARMY MEDICAL SERVICE.

- Col. J. D. Alexander, D.S.O., M.B.
Capt. (Acting Major) T. H. Balfour, M.B., Royal Army Medical Corps.
Col. F. W. Begbie.
Lieut.-Col. (Temp. Col.) W. Bennett, D.S.O., M.B., Royal Army Medical Corps.
Temp. Capt. (Acting Major) W. S. S. Berry, M.B., Royal Army Medical Corps.
Col. W. W. O. Beveridge, C.B., D.S.O., M.B.
Col. R. J. Blackham, C.M.G., C.I.E., D.S.O., M.D., F.F.P.S.
Lieut.-Col. (Acting Col.) W. R. Blackwell, C.M.G.
Capt. (Acting Major) H. E. A. Boldero, Royal Army Medical Corps.
Capt. and Brevet Major (Acting Major) L. G. Bourdillon, D.S.O., M.C., Royal Army Medical Corps.
Lieut.-Col. (Temp. Col.) A. W. N. Bowen, D.S.O., Royal Army Medical Corps.
Lieut.-Col. and Brevet Col. F. J. Brackenridge, C.M.G., Royal Army Medical Corps.
Col. H. A. Bray, C.M.G.
Temp. Capt. (Acting Major) L. R. Broster, M.B., Royal Army Medical Corps.
Major and Brevet Lieut.-Col. C. G. Browne, D.S.O., Royal Army Medical Corps.
Lieut.-Col. (Temp. Col.) B. B. Burke, D.S.O., Royal Army Medical Corps.
Major-Gen. (Temp. Lieut.-Gen.) C. H. Burtchaell, K.C.B., C.M.G., M.B., K.H.S.
Lieut.-Col. (Temp. Col.) J. H. Campbell, D.S.O., Royal Army Medical Corps.
Major-Gen. H. Carr, C.B., M.D.
Col. J. Clay, M.B., F.R.C.S., Territorial Force.
Lieut.-Col. (Acting Col.) H. Collinson, C.M.G., D.S.O., M.B., Royal Army Medical Corps (Territorial Force).
Major D. M. Corbett, M.B., Royal Army Medical Corps.
Capt. (Acting Major) W. V. Corbett, Royal Army Medical Corps.
Capt. (Acting Major) J. Dale, M.B., Royal Army Medical Corps (Territorial Force)
Lieut.-Col. B. R. Dennis, O.B.E., M.B., Royal Army Medical Corps.
Lieut.-Col. (Acting Col.) T. F. Dewar, C.B., T.D., M.D., Royal Army Medical Corps (Territorial Force).
Capt. (Acting Major) R. F. Dickinson, O.T., M.B., Royal Army Medical Corps.
Lieut.-Col. and Brevet Col. (Temp. Col.) H. E. M. Douglas, V.C., C.M.G., D.S.O., Royal Army Medical Corps.
Capt. (Acting Major) C. R. Dudgeon, M.C., Royal Army Medical Corps.
Col. H. N. Dunn, C.M.G., D.S.O., M.B.

- Major J. S. Dunne, D.S.O., F.R.C.S.I., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) O. W. A. Elsner, D.S.O., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) H. B. Fawcus, C.M.G., D.S.O., M.B., Royal Army Medical Corps.
 Capt. (Acting Major) A. McL. Ferrie, M.C., Royal Army Medical Corps (Special Reserve).
 Col. R. H. Firth, C.B., F.R.C.S.
 Lieut.-Col. (Acting Col.) Fitz-G. G. Fitz-Gerald, D.S.O., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) T. Fraser, D.S.O., M.B., Royal Army Medical Corps (Territorial Force).
 Capt. (Acting Major) T. L. Fraser, M.B., Royal Army Medical Corps.
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 Major-Gen. J. J. Gerrard, C.B., M.B.
 Col. T. W. Gibbard, C.B., M.B., K.H.S.
 Capt. (Acting Major) G. F. P. Gibbons, Royal Army Medical Corps (Special Reserve).
 Capt. (Acting Major) A. J. Gibson, D.S.O., Royal Army Medical Corps (Special Reserve).
 Lieut.-Col. (Acting Col.) G. M. Goldsmith, M.B., Royal Army Medical Corps.
 Col. H. W. Grattan, D.S.O., Royal Army Medical Corps.
 Capt. (Acting Major) W. T. Hare, M.C., Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) J. A. Hartigan, C.M.G., D.S.O., M.B., Royal Army Medical Corps.
 Capt. (Acting Major) S. M. Hattersley, M.C., M.B., Royal Army Medical Corps.
 Major A. H. Heslop, D.S.O., M.B., Royal Army Medical Corps.
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 Lieut.-Col. (Temp. Col.) D. O. Hyde, D.S.O., M.B., Royal Army Medical Corps.
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 Col. F. Kelly, T.D., M.D., Territorial Force.
 Lieut. (Temp. Capt. and Acting Major) M. B. King, M.C., M.B., Royal Army Medical Corps.
 Temp. Capt. (Acting Major) C. Kingston, Royal Army Medical Corps.
 Capt. (Acting Lieut.-Col.) F. R. Laing, M.B., Royal Army Medical Corps.
 Major (Acting Lieut.-Col.) R. W. D. Leslie, Royal Army Medical Corps.
 Major (Acting Col.) C. H. Lindsay, C.M.G., D.S.O., M.D., Royal Army Medical Corps (Territorial Force).
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 Lieut.-Col. (Acting Col.) A. M. MacLaughlin, M.B., Royal Army Medical Corps.
 Col. R. L. R. Macleod, C.B., M.B.
 Capt. (Acting Major) W. W. MacNaught, M.C., M.B., Royal Army Medical Corps.
 Capt. (Acting Major) E. B. Marsh, M.C., M.B., Royal Army Medical Corps.
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 Major-Gen. Sir M. W. O'Keeffe, K.C.M.G., C.B., M.D.
 Capt. (Acting Major) M. W. Paterson, M.C., Royal Army Medical Corps (Special Reserve).
 Col. R. H. Penton, D.S.O.

Col. C. E. Pollock, D.S.O.

Lieut.-Col. (Temp. Col.) J. Powell, D.S.O., M.B., Royal Army Medical Corps.

Col. H. V. Prynn, D.S.O., F.R.C.S., Royal Army Medical Corps.

Major J. D. Richmond, D.S.O., M.B., Royal Army Medical Corps.

Major M. B. H. Ritchie, D.S.O., M.B., Royal Army Medical Corps.

Capt. (Acting Major) A. L. Robertson, M.B., Royal Army Medical Corps.

Capt. (Acting Major) W. H. Rowell, M.D., Royal Army Medical Corps (Territorial Force).

Major and Brevet Lieut.-Col. (Temp. Lieut.-Col.) E. Ryan, C.M.G., D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) A. H. Safford, Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) J. P. Silver, D.S.O., M.B., Royal Army Medical Corps.

Temp. Capt. (Acting Major) G. W. Smith, M.B., Royal Army Medical Corps.

Lieut.-Col. S. B. Smith, D.S.O., M.D., Royal Army Medical Corps.

Col. J. C. B. Statham, C.M.G.

Lieut.-Col. G. N. Stephen, Royal Army Medical Corps.

Capt. (Acting Major) A. D. Stirling, D.S.O., M.B., Royal Army Medical Corps.

Major-Gen. H. N. Thompson, C.B., C.M.G., D.S.O., M.B.

Major-Gen. J. Thomson, C.B., M.B.

Col. H. S. Thurston, C.B., C.M.G.

Capt. (Acting Major) L. R. Tosswill, Royal Army Medical Corps (Territorial Force).

Major (Acting Lieut.-Col.) W. F. Tyndale, C.M.G., D.S.O., M.D., Royal Army Medical Corps.

Temp. Capt. (Acting Major) F. B. Winfield, Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) E. A. Wraith, D.S.O., Royal Army Medical Corps (Territorial Force).

Capt. (Acting Major) R. L. Ritchie, M.B., Royal Army Medical Corps.

Consultants.

Col. H. A. Ballance, C.B., M.D., F.R.C.S.

Lieut.-Col. S. G. Barling, M.B., F.R.C.S.

Temp. Major-Gen. Sir A. A. Bowlby, K.C.M.G., K.C.V.O., C.B., F.R.C.S. (Lieut.-Col., Royal Army Medical Corps, Territorial Force).

Temp. Major-Gen. Sir J. R. Bradford, K.C.M.G., C.B., M.D., F.R.C.S. (Major, Royal Army Medical Corps, Territorial Force).

Temp. Col. W. P. S. Branson, M.D., F.R.C.P.

Col. H. A. Bruce, F.R.C.S.

Temp. Lieut.-Col. H. Burrows, O.B.E., M.B., F.R.C.S. (Capt. (Acting Major), Royal Army Medical Corps, Territorial Force).

Temp. Lieut.-Col. R. H. Cooper.

Col. S. L. Cummins, C.M.G., M.D.

Col. T. R. Elliott, D.S.O., M.D.

Temp. Col. C. H. S. Frankau, D.S.O., M.B., F.R.C.S. (Capt. and Brevet Major, Royal Army Medical Corps, Territorial Force).

Temp. Capt. (Acting Lieut.-Col.) F. Fraser, F.R.C.S.

Major (Temp. Lieut.-Col.) A. M. H. Gray, M.D. (Major, Royal Army Medical Corps, Territorial Force).

Temp. Major-Gen. Sir W. P. Herringham, C.B., M.D. (Lieut.-Col., Royal Army Medical Corps, Territorial Force).

Temp. Lieut.-Col. G. M. Holmes, C.M.G., M.D.

Temp. Col. W. T. Lister, C.M.G., M.B., F.R.C.S.

Major (Acting Lieut.-Col.) H. MacCormac, M.D., F.R.C.P.

Temp. Col. C. H. Miller, M.D., F.R.C.P.

Temp. Col. W. Pasteur, C.M.G., M.D., F.R.C.S. (Lieut.-Col., Royal Army Medical Corps, Territorial Force).

Col. E. M. Pilcher, C.B., D.S.O., M.B., F.R.C.S., K.H.S.

Lieut.-Col. W. Thorburn, C.B., M.D., F.R.C.S.

Temp. Major-Gen. C. S. Wallace, C.B., C.M.G.

Temp. Col. A. E. Webb-Johnson, D.S.O., M.B., F.R.C.S. (Capt., Royal Army Medical Corps, Territorial Force).

ROYAL ARMY MEDICAL CORPS.

Major (Temp. Lieut.-Col.) D. Ahern, D.S.O., 11th Field Ambulance.

Major (Acting Lieut.-Col.) R. B. Ainsworth, D.S.O.

Temp. Capt. (Acting Major) R. C. Alexander, M.B., F.R.C.S.

Temp. Capt. F. J. Allen, M.C., M.B.

- Temp. Capt. T. S. Allen, Lahore Indian Hospital.
 Capt. (Acting Major) W. B. Allen, V.C., D.S.O., M.C., M.B., attached 1/3rd (West Riding) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Major A. C. Amy, D.S.O., M.D., attached 2/1st (High) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. (Acting Major) J. R. Anderson, M.B.
 Temp. Capt. W. Anderson, M.B., F.R.C.S.
 Temp. Capt. (Acting Major) W. B. G. Angus, M.C., M.B.
 Qmr. and Temp. Lieut. T. Armitage, 57th Field Ambulance.
 Lieut.-Col. M. H. Babington, D.S.O., Commanding 2nd General Hospital.
 Temp. Capt. L. W. Bain, M.C., M.B., 138th Field Ambulance.
 Major J. H. Barbour, M.B.
 Qmr. and Capt. A. P. Barnard.
 Temp. Capt. E. F. Bashford, M.D.
 Lieut.-Col. (Temp. Col.) H. R. Bateman, D.S.O.
 Qmr. and Capt. (Temp. Major) D. C. Baxter.
 Qmr. and Temp. Capt. S. T. Beard, 77th Field Ambulance.
 Temp. Capt. (Acting Major) F. G. Bell, M.C., M.D., F.R.C.S., 48th Casualty Clearing Station.
 Qmr. and Major G. A. Benson, D.C.M. (Hon. Capt., Reserve of Officers, Retired Pay).
 Temp. Capt. G. W. Beresford, F.R.C.S., 8th General Hospital.
 Capt. A. W. Bevis.
 Capt. (Acting Lieut.-Col.) F. E. Bissell, M.D., 58th Field Ambulance.
 Temp. Capt. G. W. Bissett, M.D.
 Temp. Capt. (Acting Major) P. L. Blaber, attached 26th (Wessex) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Major R. B. Black, D.S.O., M.B. (Reserve of Officers).
 Temp. Capt. E. W. Blake, 18th Casualty Clearing Station.
 Capt. and Brevet Major (Acting Lieut.-Col.) H. H. Blake, M.D.
 Temp. Capt. V. H. Blake, M.B.
 Capt. (Acting Lieut.-Col.) J. D. Bowie, D.S.O., M.B., 33rd Field Ambulance.
 Temp. Capt. C. E. Boyce, 83rd General Hospital.
 Major (Acting Lieut.-Col.) W. W. Boyce, D.S.O., 2nd Field Ambulance.
 Qmr. and Capt. G. T. Bray.
 Qmr. and Capt. W. Brennan, 49th Casualty Clearing Station.
 Temp. Capt. A. B. Brook, M.B., attached 1/1st Battalion, Hereford Regiment (Territorial Force).
 Temp. Major R. W. Bruce, M.D., F.R.C.S., 136th Field Ambulance.
 Major (Acting Lieut.-Col.) J. C. G. Carmichael, M.B., 29th Casualty Clearing Station.
 Major (Acting Lieut.-Col.) W. J. C. Bell, D.S.O., M.B., 111th Field Ambulance.
 Qmr. and Capt. G. W. Carnell, 3rd General Hospital.
 Temp. Capt. (Acting Major) A. M. Caverhill, 52nd Field Ambulance.
 Capt. (Acting Lieut.-Col.) C. Clarke, D.S.O., M.B., F.R.C.S.
 Temp. Capt. (Acting Major) G. Clarke, M.D.
 Temp. Capt. H. E. Clutterbuck, M.D., F.R.C.S.
 Major (Acting Lieut.-Col.) T. S. Coates, O.B.E., M.B.
 Capt. (Temp. Major) F. E. Collard.
 Temp. Capt. (Acting Major) J. R. Collins, M.D., 30th General Hospital.
 Temp. Capt. C. G. Colyer.
 Temp. Capt. (Acting Major) J. D. Cooke, M.B., F.R.C.S.
 Temp. Capt. (Acting Major) R. C. Cooke, D.S.O., M.C., 134th Field Ambulance.
 Col. R. J. Copeland, M.B.
 Temp. Capt. W. J. Corbett, F.R.C.S.I., 83rd General Hospital.
 Temp. Capt. C. C. C. Court, M.B., 1st Cavalry Field Ambulance.
 Temp. Capt. J. Coutts, M.B., 14th General Hospital.
 Temp. Hon. Major E. G. Crabtree.
 Major and Brevet Lieut.-Col. (Acting Lieut.-Col.) B. A. Craig.
 Temp. Capt. J. G. Craig, M.B., F.R.C.S., 6th Stationary Hospital.
 Temp. Capt. W. Craig, M.B., 50th Field Ambulance.
 Major (Acting Lieut.-Col.) J. M. M. Crawford, F.R.C.S., 15th Casualty Clearing Station.
 Temp. Qmr. and Capt. T. A. Crichton, 52nd Field Ambulance.
 Temp. Hon. Major B. Crothers.
 Temp. Capt. J. Cruickshank, M.D.
 Temp. Capt. A. J. W. Cunningham, M.D.
 Major J. F. Cunningham, 83rd General Hospital.
 Temp. Capt. W. B. Dalgleish, 5th Casualty Clearing Station.
 Temp. Qmr. and Lieut. G. J. Darke, 19th Field Ambulance.

Temp. Capt. (Acting Lieut.-Col.) H. S. Davidson, M.B., F.R.C.S., 109th Field Ambulance.

Temp. Capt. H. R. Davies, M.D., 61st Casualty Clearing Station.

Capt. (Acting Lieut.-Col.) R. M. Davies, M.B., 34th Field Ambulance.

Temp. Capt. S. T. Davies, 12th Casualty Clearing Station.

Temp. Capt. G. de H. Dawson, M.C.

Temp. Capt. (Acting Major) W. Deane, 72nd General Hospital.

Major (Acting Lieut.-Col.) G. De la Cour, M.B., 4th Casualty Clearing Station.

Temp. Capt. A. W. Dennis, M.B., 10th Casualty Clearing Station.

Temp. Capt. E. R. Dermer, attached 5th Battalion, Royal Berks Regiment.

Temp. Capt. R. S. Dobbin, M.D.

Temp. Capt. (Acting Major) A. W. H. Donaldson, M.B., 18th Casualty Clearing Station.

Lieut.-Col. C. G. Douglas, M.C., M.D.

Major J. H. Douglass, M.D.

Major (Acting Lieut.-Col.) C. M. Drew, M.B., 134th Field Ambulance.

Temp. Hon. Lieut.-Col. G. Dreyer, attached Royal Air Force.

Temp. Capt. J. D. Driberg, M.C., F.R.C.S.

Qmr. and Capt. C. Drury, 20th Field Ambulance.

Temp. Capt. C. E. Dukes, M.B., 3rd Casualty Clearing Station.

Temp. Capt. (Acting Major) J. G. Duncanson, M.B., 72nd General Hospital.

Temp. Capt. E. C. Dutton, M.B., F.R.C.S., attached 51st Labour Group, Labour Corps.

Qmr. and Capt. (Temp. Major) E. Edser.

Temp. Capt. H. H. Elliot, M.C., M.B., 24th Field Ambulance.

Major (Acting Lieut.-Col.) A. C. Elliott, M.B., 3rd Cavalry Field Ambulance.

Temp. Capt. C. M. G. Elliott, attached Tank Corps.

Capt. (Acting Major) R. Ellis, M.C., M.B., 5th Field Ambulance.

Major (Acting Lieut.-Col.) H. H. A. Emerson, D.S.O., 44th Casualty Clearing Station.

Lieut.-Col. and Brevet Col. (Temp. Col.) H. Ensor, C.M.G., D.S.O., M.B.

Qmr. and Capt. (Temp. Major) E. W. J. Escott.

Lieut.-Col. (Acting Col.) C. R. Evans, D.S.O.

Temp. Capt. M. du B. Ferguson, M.D.

Major (Acting Lieut.-Col.) E. G. Ffrench, M.D., F.R.C.S.

Qmr. and Capt. C. A. Figg, 59th Casualty Clearing Station.

Temp. Capt. G. Fildes, M.B., 4th Mobile X-Ray Unit.

Qmr. and Capt. F. J. Filmer.

Temp. Hon. Capt. E. S. Fish.

Temp. Capt. A. Fleming, M.B., F.R.C.S.

Capt. (Acting Lieut.-Col.) J. H. Fletcher, D.S.O., M.C., Commanding 36th Field Ambulance.

Major (Acting Lieut.-Col.) A. D. Fraser, D.S.O., M.C., M.B., 9th Field Ambulance.

Temp. Capt. J. E. Frere, M.B., 39th Casualty Clearing Station.

Temp. Capt. T. F. S. Fulton, M.B., 9th Mobile Hygienic Laboratory.

Temp. Capt. (Acting Major) H. W. Gabe, F.R.C.S., 56th Casualty Clearing Station.

Capt. (Acting Lieut.-Col.) R. W. Galloway, M.B., 2nd Cavalry Field Ambulance.

Temp. Capt. G. C. Gell, 54th Field Ambulance.

Temp. Capt. (Acting Major) W. E. Gemmell, M.B.

Capt. (Acting Major) C. de W. Gibb.

Capt. and Brevet Major H. G. Gibson.

Temp. Capt. E. C. Girling, M.D., 19th Casualty Clearing Station.

Temp. Capt. S. R. Gleed, attached 2/3rd (S. Mid.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) H. Goodman, 76th Field Ambulance.

Lieut.-Col. (Acting Col.) W. R. P. Goodwin, D.S.O.

Temp. Qmr. and Capt. W. Gough, 99th Field Ambulance.

Temp. Capt. C. B. Goulden, M.D., F.R.C.S.

Major (Acting Lieut.-Col.) A. C. H. Gray, M.B., 19th Casualty Clearing Station.

Qmr. and Capt. (Acting Major) R. H. Green, 1st Advanced Depot Medical Stores.

Temp. Major K. E. L. G. Gunn, 83rd General Hospital.

Capt. (Acting Lieut.-Col.) H. A. Harbison, M.C., M.B., 140th Field Ambulance.

Temp. Capt. T. H. Harker, M.D., 10th Field Ambulance.

Temp. Capt. D. T. Harris, M.B., attached Headquarters, 29th Brigade, Royal Field Artillery.

Temp. Capt. J. N. J. Hartley, M.B., F.R.C.S.

Major (Acting Lieut.-Col.) W. J. S. Harvey, D.S.O., 36th Casualty Clearing Station.

Temp. Capt. T. A. Hawkesworth, M.B.

Lieut.-Col. E. C. Hayes, Commanding 47th General Hospital.

Temp. Capt. E. D. F. Hayes, M.B., attached 1st Battalion, Northumberland Regiment.

Major (Acting Lieut.-Col.) A. F. Heaton (Reserve of Officers).

- Temp. Capt. A. G. Henderson, M.B., 59th Casualty Clearing Station.
 Capt. (Acting Major) R. A. Hepple, M.C., M.B., 28th Field Ambulance.
 Temp. Capt. W. Herbertson, M.B.
 Temp. Capt. E. Hesterlow, M.B., attached 16th Battalion, Lancashire Fusiliers.
 Temp. Capt. (Acting Major) T. T. Higgins, M.B., F.R.C.S., 2nd Stationary Hospital.
 Temp. Capt. R. McC. Hill, D.S.O., M.B., attached 2nd Battalion, Argyle and Sutherland Highlanders.
 Temp. Capt. (Acting Lieut.-Col.) G. D. Hindley, M.C., 50th Field Ambulance.
 Temp. Qmr. and Capt. C. W. Hook, 42nd Field Ambulance.
 Temp. Capt. A. N. Hooper.
 Temp. Hon. Major C. W. M. Hope.
 Temp. Capt. E. L. Horsburg, M.D., 30th General Hospital.
 Temp. Hon. Major T. Houston, M.D.
 Capt. (Acting Lieut.-Col.) I. R. Hudleston, 136th Field Ambulance.
 Major and Brevet Lieut.-Col. (Acting Lieut.-Col.) G. W. G. Hughes, D.S.O., 17th Casualty Clearing Station.
 Lieut.-Col. E. T. Inkson, V.C., D.S.O.
 Temp. Capt. (Acting Major) J. W. Innes, M.B., 105th Field Ambulance.
 Temp. Lieut.-Col. G. S. Jackson, D.S.O., T.D. (Major and Brevet Lieut.-Col., 7th Battalion, Northumberland Fusiliers, Territorial Force).
 Temp. Qmr. and Capt. H. L. Jackson, 96th Field Ambulance.
 Temp. Capt. C. W. W. James, attached Royal Air Force.
 Lieut.-Col. J. C. Jameson, M.B.
 Temp. Qmr. and Capt. R. G. Johnston, attached 1/2nd (High) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. J. G. Johnstone, M.B., 9th Cavalry Field Ambulance.
 Qmr. and Capt. L. Jones, 31st Advanced Depot Medical Stores.
 Temp. Capt. (Acting Major) A. C. Keep, M.C., M.D., attached 1st D.A.C., Royal Field Artillery.
 Temp. Hon. Major R. F. Kennedy.
 Capt. (Acting Major) G. L. Keynes, 38th Casualty Clearing Station.
 Temp. Capt. C. King, M.B., 3rd Casualty Clearing Station.
 Temp. Major C. F. Knight, D.S.O., M.B., 133rd Field Ambulance.
 Temp. Hon. Major L. F. Knuthsen, M.D.
 Capt. (Acting Lieut.-Col.) E. C. Lang, D.S.O., M.B., 94th Field Ambulance.
 Qmr. and Capt. H. B. Lee, 51st Field Ambulance.
 Capt. (Acting Lieut.-Col.) H. H. Leeson, M.C., 77th Field Ambulance.
 Temp. Capt. T. P. Lewis.
 Temp. Capt. (Acting Major) S. J. L. Lindeman, M.C.
 Temp. Capt. (Acting Major) E. C. Lindsay, M.B., F.R.C.S., 32nd Stationary Hospital.
 Temp. Capt. W. S. Lindsay, M.B.
 Temp. Capt. P. C. Litchfield, M.C., 15th Motor Ambulance Convoy.
 Temp. Capt. J. S. Lloyd, M.B.
 Temp. Capt. (Acting Major) A. L. Lockwood, D.S.O., M.C., M.D.
 Temp. Major (Acting Lieut.-Col.) C. E. M. Lowe, M.B., 4th Convalescent Depot (Major, Royal Garrison Artillery, Territorial Force).
 Qmr. and Capt. W. E. Lowe.
 Temp. Capt. N. P. L. Lumb, M.B., 39th General Hospital.
 Temp. Capt. F. C. MacDonald, M.B.
 Major (Acting Lieut.-Col.) W. MacD. Macdowall.
 Temp. Capt. W. MacEwen, M.B.
 Temp. Capt. (Acting Major) R. B. Macfie, M.B., F.R.C.S., 55th Casualty Clearing Station.
 Temp. Qmr. and Capt. J. B. Mackay, 92nd Field Ambulance.
 Temp. Capt. (Acting Major) C. Mackenzie, F.R.C.S., 14th General Hospital.
 Major (Acting Lieut.-Col.) D. F. Mackenzie, D.S.O., M.D., 59th Field Ambulance.
 Temp. Capt. D. Mackinnon, M.B., attached Headquarters, 282nd Army Brigade, Royal Field Artillery.
 Temp. Capt. J. W. Macleod, O.B.E., M.B.
 Temp. Capt. A. S. L. Malcolm, attached 1/1st (E. Ang.) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. E. C. Malden.
 Temp. Capt. A. C. Maun, M.C., M.B., attached 8th Battalion, South Wales Borderers.
 Temp. Capt. (Acting Major) F. B. Manser, M.B., 43rd Casualty Clearing Station.
 Major (Acting Lieut.-Col.) P. J. Marett.
 Temp. Capt. O. de B. Marsh, M.B.
 Temp. Capt. R. P. Marshall.
 Temp. Capt. (Acting Major) W. S. Martin, M.C., M.B.

Temp. Capt. (Acting Major) R. Massie, F.R.C.S., 47th General Hospital.
 Temp. Capt. H. N. Matthews, 63rd Field Ambulance.
 Temp. Capt. O. S. Maunsell.
 Capt. (Acting Major) C. A. R. McCay, 90th Field Ambulance.
 Qmr. and Capt. (Temp. Major) T. E. McColgin.
 Temp. Lieut. T. McLaren, M.B., 132nd Field Ambulance.
 Temp. Capt. G. McLeod, M.C., M.B.
 Temp. Capt. D. McNeill, M.B., 23rd Ambulance Train.
 Temp. Capt. J. P. McVey, M.C., attached 9th Battalion, Norfolk Regiment.
 Major A. A. Meaden, D.S.O.
 Lieut.-Col. T. I. N. Mears, D.S.O.
 Temp. Capt. C. H. Medlock, attached Tank Corps.
 Temp. Capt. A. U. Millar, M.C., M.B., attached 1/3rd (N. Mid.) Field Ambulance,
 Royal Army Medical Corps (Territorial Force).
 Temp. Capt. H. C. D. Miller, M.B., attached 5th (London) Field Ambulance, Royal
 Army Medical Corps (Territorial Force).
 Temp. Capt. E. T. C. Milligan, M.D.
 Temp. Capt. J. H. Moir, D.S.O., M.C., M.D., attached 17th Battalion, Royal Fusiliers.
 Capt. (Acting Lieut.-Col.) H. G. Monteith, D.S.O., 47th Field Ambulance.
 Capt. A. T. Moon, F.R.C.S., 4th Cavalry Field Ambulance.
 Major E. H. M. Moore, D.S.O., 1st (U.S.A.) General Hospital.
 Capt. (Acting Major) J. Y. Moore, 1st Cavalry Field Ambulance.
 Temp. Capt. R. F. Moore, F.R.C.S.
 Major (Acting Lieut.-Col.) C. R. M. Morris, D.S.O., M.B., 99th Field Ambulance.
 Temp. Capt. (Acting Major) J. Morrison, M.B., 20th Casualty Clearing Station.
 Temp. Capt. J. T. Morrison, M.B., F.R.C.S.
 Temp. Capt. H. P. Morton, 32nd Ambulance Train.
 Temp. Capt. (Acting Major) F. H. Moxon, M.B., 73rd General Hospital.
 Capt. W. P. Mulligan, O.B.E., M.B.
 Lieut.-Col. C. D. Myles, O.B.E., M.B.
 Temp. Capt. F. L. Napier, M.B., 45th Casualty Clearing Station.
 Temp. Capt. G. L. Neil, attached 182nd Tunnelling Company, Royal Engineers.
 Major (Acting Lieut.-Col.) R. E. U. Newman, M.C., M.B., 100th Field Ambulance.
 Capt. (Acting Major) C. V. Nicoll, 112th Field Ambulance.
 Temp. Capt. (Acting Major) A. A. O'Connor.
 Lieut.-Col. C. J. O'Gorman, D.S.O.
 Major (Acting Lieut.-Col.) D. de C. O'Grady.
 Qmr. and Capt. E. O'Hara, 10th Field Ambulance.
 Temp. Capt. M. W. B. Oliver, M.B., F.R.C.S.
 Qmr. and Major J. W. Osborne.
 Temp. Capt. H. B. Owens, 57th Field Ambulance.
 Major (Acting Lieut.-Col.) G. R. Painton.
 Temp. Capt. (Acting Major) A. C. Palmer, M.B., F.R.C.S.
 Major J. S. Pascoe, D.S.O.
 Temp. Capt. (Acting Major) J. A. Paterson, M.C., M.B., attached 2/3rd (London) Field
 Ambulance, Royal Army Medical Corps (Territorial Force).
 Temp. Capt. E. J. Peill, M.B., F.R.C.S., 3rd Native Labour General Hospital.
 Major H. M. J. Perry.
 Temp. Capt. (Acting Major) W. de M. Peyton, M.B., attached 1st Stationary Hospital.
 Capt. (Acting Lieut.-Col.) E. Phillips, M.C., M.B., 106th Field Ambulance.
 Temp. Capt. S. E. Picken, M.B., 109th Field Ambulance.
 Temp. Capt. (Acting Major) B. Pickering, M.B., 20th Casualty Clearing Station.
 Temp. Capt. A. E. Pinniger, M.B.
 Temp. Capt. G. Pirie, M.B., 2nd Stationary Hospital.
 Capt. (Acting Lieut.-Col.) A. M. Pollard, D.S.O., 93rd Field Ambulance.
 Qmr. and Capt. A. G. Powell, 14th Stationary Hospital.
 Temp. Capt. (Acting Major) H. W. Powell, 137th Field Ambulance.
 Temp. Capt. (Acting Major) E. G. C. Price, M.B., 22nd Casualty Clearing Station.
 Temp. Capt. J. Pryce-Davies.
 Temp. Capt. G. R. B. Purce, M.C., M.B., 48th Casualty Clearing Station.
 Temp. Capt. E. H. Rainey, F.R.C.S.
 Capt. (Acting Lieut.-Col.) H. C. D. Rankin, M.B., 4th Field Ambulance.
 Temp. Capt. S. P. Rea, M.B., 108th Field Ambulance.
 Temp. Capt. W. A. Rees, 5th Casualty Clearing Station.
 Qmr. and Capt. (Acting Major) W. C. Renton.
 Lieut.-Col. (Acting Col.) W. Riach, C.M.G., M.D., Commanding 74th General Hospital.
 Temp. Capt. J. E. Richards, M.B., 107th Field Ambulance.
 Temp. Capt. (Acting Major) J. E. H. Roberts, M.B., F.R.C.S.

Temp. Capt. R. C. Robertson, M.B., attached 173rd Tunnelling Company, Royal Engineers.

Temp. Capt. G. Robinson, 2/1st (Wessex) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. W. J. Ronan, M.B.

Major (Acting Lieut.-Col.) F. E. Rowan-Robinson, M.B., Commanding 5th Stationary Hospital.

Temp. Lieut.-Col. R. J. Rowlette, M.D., F.R.C.S., attached 83rd General Hospital.

Major (Acting Lieut.-Col.) G. F. Rudkin, D.S.O., 9th Field Ambulance.

Temp. Capt. (Acting Major) J. C. Sale, D.S.O., M.C., 56th Field Ambulance.

Major (Temp. Lieut.-Col.) F. C. Sampson, D.S.O., M.D., 91st Field Ambulance.

Temp. Capt. (Acting Major) H. H. Sampson, M.C., M.B., F.R.C.S.

Temp. Capt. (Acting Major) H. W. Scawin.

Temp. Capt. A. Scott, M.B., 44th Field Ambulance.

Qmr. and Major R. Scott, 3rd Stationary Hospital.

Temp. Capt. (Acting Major) E. J. Belby.

Temp. Capt. H. P. Shackleton, M.B.

Temp. Capt. W. Shanks, M.B., attached Headquarters, 227th Army Brigade, Royal Field Artillery.

Temp. Hon. Major G. C. Shattuck.

Temp. Capt. H. L. Shelton, attached 48th Labour Group, Labour Corps.

Temp. Capt. H. J. Shone, M.B., 4th Cavalry Field Ambulance.

Major (Acting Lieut.-Col.) H. C. Sidgwick, M.B., 22nd Casualty Clearing Station.

Temp. Qmr. and Capt. H. F. Simnett, 103rd Field Ambulance.

Lieut.-Col. (Acting Col.) H. Simson.

Temp. Capt. A. F. S. Sladden, M.D.

Temp. Capt. J. M. Smeaton, attached 2/1st (Home Counties) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Capt. (Acting Lieut.-Col.) J. C. Sproule, 131st Field Ambulance.

Temp. Capt. C. M. Stallard, M.B., 61st Field Ambulance.

Temp. Capt. (Acting Major) E. G. Stanley, M.B., F.R.C.S., 61st Casualty Clearing Station.

Temp. Major F. N. G. Starr.

Temp. Capt. R. S. S. Statham, M.D., 6th General Hospital.

Temp. Capt. W. Stirling, M.B., 35th General Hospital.

Temp. Capt. A. Stokes, D.S.O., M.D., F.R.C.S.

Temp. Capt. (Acting Lieut.-Col.) H. Stokes, M.D., F.R.C.S.

Temp. Capt. C. P. A. Stranaghan, M.B., 49th Casualty Clearing Station.

Capt. (Acting Lieut.-Col.) J. W. C. Stubbs, M.C., M.V., 16th Field Ambulance.

Temp. Capt. E. J. Stuckey, M.B.

Temp. Capt. (Acting Major) C. Sullivan, F.R.C.S., 75th Field Ambulance.

Major (Acting Lieut.-Col.) G. G. Tabuteau, D.S.O., 1st Field Ambulance.

Temp. Capt. R. J. Tait, M.B., attached 2/2nd (Northern) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) D. C. Taylor, M.C., M.B., F.R.C.S.

Temp. Major G. Taylor, M.B., F.R.C.S.

Lieut.-Col. (Temp. Col.) W. Taylor, M.B., F.R.C.S.I., 83rd (Dublin) General Hospital.

Temp. Capt. L. H. Terry, Lucknow Casualty Clearing Station.

Temp. Qmr. and Capt. J. Tewkesbury, 74th General Hospital.

Major (Acting Lieut.-Col.) W. I. Thompson, D.S.O., M.B., attached 65th (East Lancashire) Field Ambulance, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Lieut.-Col.) F. R. Thornton, M.C., M.B., 15th Field Ambulance.

Temp. Capt. (Acting Major) R. Tindall, M.C., M.B., 27th Field Ambulance.

Temp. Capt. (Acting Major) A. T. Todd, M.B.

Temp. Capt. R. S. Topham, M.B., attached Royal Air Force.

Temp. Capt. R. H. Tribe, M.C., attached 15th Hussars.

Temp. Capt. C. N. Vaisey, attached 12th Battalion, Tank Corps.

Capt. (Acting Major) B. Varvill, M.C., 17th Field Ambulance.

Temp. Capt. (Acting Major) P. N. Vellacott, M.B., F.R.C.S.

Temp. Capt. (Acting Major) H. M. Vickers, M.B., 47th Field Ambulance.

Capt. F. S. Walker, M.D.

Temp. Capt. J. C. Walker, 41st Stationary Hospital.

Temp. Capt. A. B. Waller, M.B., attached Tank Corps.

Temp. Capt. (Acting Major) H. H. Warren, M.B., 45th Field Ambulance.

Major (Acting Lieut.-Col.) W. J. Waters, 21st Casualty Clearing Station.

Temp. Capt. E. J. M. Watson.

Temp. Capt. (Acting Major) H. C. Watson, M.C., M.B., 102nd Field Ambulance.

Capt. (Acting Lieut.-Col.) L. F. K. Way, 101st Field Ambulance.

- Temp. Capt. F. E. Webb, M.B., attached 17th Battalion, Royal Sussex Regiment.
 Temp. Capt. (Acting Major) F. W. Wesley, M.D., 44th Casualty Clearing Station.
 Temp. Capt. F. Whitby, M.B., attached Headquarters, 38th Army Brigade, Royal Field Artillery.
- Major C. F. White, M.B.
 Temp. Capt. M. H. Whiting, M.B.
 Qmr. and Capt. J. Wickersham, 45th Casualty Clearing Station.
 Temp. Capt. A. R. Wightman, M.B.
 Major (Temp. Lieut.-Col) A. J. Williamson, M.B., 12th Casualty Clearing Station.
 Temp. Capt. J. Williamson, M.B., attached 19th Battalion, Middlesex Regiment.
 Temp. Capt. G. R. Wilson, attached 14th Battalion, Welsh Regiment.
 Temp. Capt. J. A. Wilson, M.B.
 Temp. Capt. F. A. Winder, M.B.
 Major J. L. Wood.
 Temp. Capt. (Acting Major) P. R. Woodhouse, D.S.O., M.C., M.B., 9th Field Ambulance.
- Temp. Capt. E. W. N. Wooler, M.B., 41st Casualty Clearing Station.
 Temp. Capt. H. Yellowlees, M.B.
 Temp. Capt. C. R. Young, D.S.O., M.C., M.B., attached 1st Battalion, Shropshire Light Infantry.
- 6459 Cpl. B. R. Agnis, attached Headquarters, 5th Division.
 41801 Staff-Serjt. S. Ainsworth, 57th Field Ambulance.
 93901 Pte. (Acting Lance-Cpl.) R. Aitken, 49th Field Ambulance.
 115951 Pte. (Acting Serjt.) L. G. Alexander, attached 1/3rd (N. Mid.) Field Ambulance.
- Royal Army Medical Corps (Territorial Force).
- 39308 Cpl. W. M. Allison.
 11 Cpl. (Temp. Serjt.) J. Andre, 39th General Hospital.
 40515 Staff-Serjt. L. Annen, 43rd Field Ambulance.
 53573 Cpl. S. S. Arden, attached Headquarters, 9th Division.
 47773 Pte. C. J. Armstrong, 6th Stationary Hospital.
 80731 Pte (Acting Cpl.) H. G. Arthur.
 37604 Serjt. W. T. S. Austin, 37th Field Ambulance.
 65610 Serjt. T. C. Ayres, 104th Field Ambulance.
 38605 Serjt. A. Ayto, 53rd Field Ambulance.
 31978 Serjt. E. Bailey, 17th Mobile Laboratory.
 46022 Cpl. (Acting Serjt.) J. A. Barker, 15th Field Ambulance.
 34798 Serjt.-Major F. G. L. Barnard, 56th General Hospital.
 68145 Cpl. (Acting Serjt.) G. H. Barratt, 20th Casualty Clearing Station.
 19001 Serjt. (Temp. Staff-Serjt.) J. Barritt, 3rd Cavalry Field Ambulance.
 72712 Cpl. T. B. Beal.
 18327 Cpl. (Temp. Staff-Serjt.) G. Beattie, 3rd Field Ambulance.
 19447 Cpl. (Acting Serjt.) H. E. Beckley, 3rd Field Ambulance.
 64988 Pte. A. G. Bell, 16th Field Ambulance.
 5816 Pte. (Acting Cpl.) G. A. Bell, 13th Motor Ambulance Convoy.
 60216 Pte. W. Bendall, 1st Mobile Laboratory.
 88032 Cpl. L. F. Bennett.
 19119 Serjt. W. E. Bennett, 1st Casualty Clearing Station.
 80024 Pte. V. F. Berrett.
 74770 Pte. S. Berryman, 37th Field Ambulance.
 92084 Pte. (Acting Serjt.) A. H. Bethell.
 67403 Serjt. W. R. Bland, 97th Field Ambulance.
 51338 Cpl. A. Boden, 21st Casualty Clearing Station.
 41806 Pte. F. G. Bourne, 3rd General Hospital.
 45519 Cpl. (Acting Serjt.) J. G. Bourne, 54th Field Ambulance.
 77834 Cpl. H. Bradley, attached Headquarters, 14th Division.
 31641 Serjt.-Major J. Brett, 102nd Field Ambulance.
 44620 Pte. G. W. Brown.
 36891 Pte. E. Brown Grant.
 36892 Pte. (Acting Cpl.) J. G. Brown Grant.
 5701 Pte. (Acting Lance-Cpl.) F. G. Bush, 1st Casualty Clearing Station.
 45120 Cpl. C. L. Cabannes, 16th Advanced Depot Medical Stores.
 30350 Staff-Serjt. R. W. Cargill, 60th Field Ambulance.
 6534 Pte. (Acting Serjt.) R. W. Cathrine.
 2102 Staff-Serjt. (Temp. Qmr.-Serjt.) F. T. Catton, 19th Field Ambulance
 56758 Pte. C. L. Coaster, 17th Field Ambulance.
 743 Serjt. (Temp. Staff-Serjt.) F. C. Coles.
 34947 Staff-Serjt. A. Coulter, 18th Casualty Clearing Station
 88567 Pte. W. J. Court, 7th Field Ambulance.

7233 Pte. A. Couzens, attached 2/3rd (Wessex) Field Ambulance, Royal Army Medical Corps (Territorial Force).

14735 Staff-Serjt. J. A. C. Cox, 73rd General Hospital.

15762 Pte. (Temp. Serjt.) S. Craggs, 14th Field Ambulance.

38120 Pte. (Acting Cpl.) L. E. Dams.

38125 Serjt. A. C. Darbyshire, 48th Field Ambulance.

60608 Staff-Serjt. A. G. Davey, 94th Field Ambulance.

79690 Pte. (Acting Staff-Serjt.) J. R. Davie, attached 1/1st (E. Ang.) Field Ambulance. Royal Army Medical Corps (Territorial Force).

48520 Pte. D. R. Davies, 129th Field Ambulance.

105378 Pte. W. S. Davies, 17th Field Ambulance.

6776 Pte. P. F. Davis, 9th Field Ambulance.

4961 Cpl. F. W. Day, 14th Advanced Depot Medical Stores.

18463 Qmr.-Serjt. (Acting Serjt.-Major) F. W. Day, 8th Field Ambulance.

44230 Serjt. A. F. Dean.

61787 Cpl. B. E. F. Denman.

5597 Pte. R. E. Dennis.

71779 Serjt. E. T. Doran, 135th Field Ambulance.

69654 Pte. (Acting Lance-Cpl.) W. Dunlop.

42869 Pte. J. Ellis, 53rd Field Ambulance.

62525 Serjt. A. Evans, 92nd Field Ambulance.

47494 Pte. A. A. Fackrell, 7th Casualty Clearing Station.

38592 Pte. (Acting Lance-Cpl.) P. Forkin, 75th Field Ambulance.

73033 Pte. (Acting Lance-Serjt.) W. Forsyth, 11th Stationary Hospital.

65692 Serjt. F. Fowler, 104th Field Ambulance.

26074 Pte. H. G. Fowler, 42nd Casualty Clearing Station.

66170 Serjt. C. Fry, 100th Field Ambulance.

26900 Pte. J. F. Gatehouse, 141st Field Ambulance.

77459 Pte. A. Gibson, 17th Casualty Clearing Station.

11022 Pte. J. F. Gilrane, attached 1/1st (E. Ang.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

47456 Pte. E. H. Gowlett, 3/6th Field Ambulance.

93642 Qmr.-Serjt. W. Greer.

15996 Staff-Serjt. W. H. Griffin, 4th Motor Ambulance Convoy.

36411 Pte. T. Grimes, 33rd Field Ambulance.

59697 Serjt. G. S. Harris, 36th Casualty Clearing Station.

79104 Qmr.-Serjt. F. Harrison, attached Headquarters, 34th Division.

64601 Pte. (Acting Staff-Serjt.) H. Harrison, 113th Field Ambulance.

54378 Serjt. W. Hedley, 72nd Field Ambulance.

62145 Serjt. V. E. C. Hellrich, 44th Field Ambulance.

19656 Pte. (Acting Cpl.) G. H. Hewett, 35th Ambulance Train.

74503 Pte. E. Hibbert, 49th Casualty Clearing Station.

68336 Pte. R. Hicks.

30472 Serjt. E. Hill, 7th Ambulance Train.

61736 Pte. T. Hill, 38th Field Ambulance.

12644 Serjt. (Temp. Staff-Serjt.) F. W. Hine, 8th General Hospital.

38683 Serjt. P. Hoare, 39th Casualty Clearing Station.

90731 Pte. W. Holden.

19640 Serjt. (Temp. Staff-Serjt.) G. H. Hollands, 7th Stationary Hospital.

9512 Serjt. C. Howard, 48th Casualty Clearing Station.

41428 Cpl. W. A. Hoyer, attached Headquarters, 25th Division.

56981 Serjt. (Acting Qmr.-Serjt.) E. H. Huber, 18th Casualty Clearing Station.

58454 Staff-Serjt. F. M. Hudson, 92nd Field Ambulance.

54195 Pte. T. Hudson, 17th Casualty Clearing Station.

40665 Staff-Serjt. H. H. Humphrey, 107th Field Ambulance.

1946 Serjt. (Temp. Staff-Serjt.) E. Jane, 16th Field Ambulance.

47052 Cpl. P. Jenks, 77th Field Ambulance.

41555 Qmr.-Serjt. H. Johnson, 52nd Field Ambulance.

12953 Cpl. (Acting Serjt.) J. Jonas.

67493 Cpl. A. D. Jones, 97th Field Ambulance.

48890 Cpl. W. E. Jones.

28350 Serjt. J. W. Jowitt, 136th Field Ambulance.

12195 Staff-Serjt. A. Joyce, 14th General Hospital.

17485 Qmr.-Serjt. H. Kennedy, 1st Stationary Hospital.

12189 Pte. E. H. King, 112th Field Ambulance.

12492 Serjt. W. Kinsella, 14th Field Ambulance.

57290 Pte. C. H. Lambert, 30th Casualty Clearing Station.

59315 Pte. H. Last, attached Headquarters, 25th Division.

2545 Pte. W. Latchford, 7th Field Ambulance.
 42470 Serjt. J. Lawrence, 59th Field Ambulance.
 1856 Staff-Serjt. A. F. Leaney, 74th General Hospital.
 103639 Pte. (Acting Cpl.) J. H. Learmonth.
 16751 Qmr.-Serjt. (Acting Serjt.-Major) J. Leighton, 131st Field Ambulance.
 110608 Pte. A. Little.
 90261 Cpl. J. S. Livingston.
 55390 Pte. J. A. Logan, 19th Casualty Clearing Station.
 1718 Cpl. (Acting Serjt.) L. W. Lowe, attached Headquarters, Tenth Corps.
 81009 Pte. P. G. Lumsden, 4th Cavalry Field Ambulance.
 5132 Pte. G. H. MacFarlane.
 46574 Serjt. R. B. MacGregor, 35th General Hospital.
 90328 Pte. G. MacKenzie, attached Headquarters, 9th Division.
 33159 Pte. S. B. Malpas, 62nd Field Ambulance.
 35147 Qmr.-Serjt. J. Marshall, 62nd Field Ambulance.
 40720 Serjt. F. Martin, 33rd Field Ambulance.
 19247 Serjt. (Temp. Qmr.-Serjt.) T. H. Mason, 1st Cavalry Field Ambulance.
 35249 Pte. (Acting Cpl.) T. McDougall, attached Headquarters, 9th Division.
 55372 Cpl. A. O. McLaggan, 19th Casualty Clearing Station.
 40348 Staff-Serjt. T. B. McNamee, 20th General Hospital.
 19150 Serjt. (Temp. Staff-Serjt.) T. H. Messenger, 101st Field Ambulance.
 26635 Serjt. W. J. Miles, 44th Casualty Clearing Station.
 55686 Pte. W. O. Miles, 13th Casualty Clearing Station.
 46239 Cpl. (Acting Lance-Serjt.) D. Muskelly, 110th Field Ambulance.
 68738 Staff-Serjt. A. Mitchell, 95th Field Ambulance.
 52402 Pte. V. Mitchell, 23rd Casualty Clearing Station.
 37366 Serjt. W. Mitchell, 55th Field Ambulance.
 44108 Cpl. F. J. Molloy, M.M., 50th Field Ambulance.
 44305 Serjt. W. Muir, 10th Casualty Clearing Station.
 18863 Qmr.-Serjt. (Temp. Serjt.-Major) J. Mulcahy, 22nd Casualty Clearing Station.
 80179 Pte. (Acting Cpl.) F. C. Murrell.
 11887 Pte. G. Newis, 23rd Casualty Clearing Station.
 38925 Serjt. H. Nicholas, 36th Field Ambulance.
 75539 Cpl. C. W. Noble.
 560 Cpl. (Acting Serjt. J. Norris, 12th Stationary Hospital.
 50625 Pte. (Acting Lance-Cpl.) E. Nowell, 44th Casualty Clearing Station.
 61220 Qmr.-Serjt. E. J. Ockleford.
 44292 Serjt. V. O'Connor, 112th Field Ambulance.
 63892 Lance-Cpl. W. Olive, 105th Field Ambulance.
 34850 Pte. F. J. O'Neill, 3rd Casualty Clearing Station.
 39640 Serjt. (Acting Staff-Serjt.) H. E. Orchard, 91st Field Ambulance.
 34578 Cpl. (Acting Serjt.) G. R. Pain, 36th Casualty Clearing Station.
 81779 Pte. J. O. Parry Williams.
 53483 Pte. A. Patterson, 72nd Field Ambulance.
 18571 Staff-Serjt. (Temp. Qmr.-Serjt.) F. T. Pepper, 24th General Hospital.
 19126 Serjt. (Temp. Serjt.-Major) F. H. Perkins.
 10527 Pte. G. A. C. Perry, 10th Casualty Clearing Station.
 59664 Serjt. H. Pickles, 41st Casualty Clearing Station.
 20047 Cpl. (Temp. Serjt.) A. S. Pink, 6th Casualty Clearing Station.
 17421 Serjt. (Acting Serjt.-Major) P. Plume.
 19604 Serjt. (Temp. Serjt.-Major) R. Pollock.
 43961 Pte. (Acting Lance-Cpl.) W. H. Poulter, 2nd Field Ambulance.
 50091 Serjt. G. Precious, 73rd Field Ambulance.
 11342 Pte. (Acting Cpl.) H. C. Putman.
 41109 Staff-Serjt. W. Quinn, 38th Casualty Clearing Station.
 47806 Serjt. C. Railton, 105th Field Ambulance.
 19716 Serjt. (Temp. Staff-Serjt.) F. Reynolds, 17th Field Ambulance.
 5614 Cpl. G. Reynolds, 5th Motor Ambulance Convoy.
 73555 Pte. (Acting Serjt.) G. M. Rigby, 34th Advanced Depot Medical Stores.
 61554 Pte. A. Robins, 90th Field Ambulance.
 3504 Pte. J. Robinson, 5th Field Ambulance.
 106920 Pte. Rooke, 48th Casualty Clearing Station.
 43240 Serjt. (Acting Staff-Serjt.) G. Ruddle.
 45289 Pte. T. D. Salmon, 15th Casualty Clearing Station.
 88533 Pte. F. W. Saunders.
 10134 Pte. (Acting Cpl.) S. Sayer, 10th Ambulance Train.
 30804 Cpl. J. Scott.
 57078 Qmr.-Serjt. (Acting Serjt.-Major) A. B. Shaw, 25th General Hospital.

- 40862 Pte. C. Shenton, 54th Field Ambulance.
 7211 Pte. V. C. D. Sims, 19th Field Ambulance.
 5121 Pte. (Acting Cpl.) A. P. Simson, 36th Ambulance Train.
 43795 Pte. H. V. Sinclair, 11th Casualty Clearing Station.
 73669 Pte. (Acting Cpl.) W. Slack, 43rd Casualty Clearing Station.
 71778 Pte. H. Slater, 135th Field Ambulance.
 34491 Serjt. A. J. Smith, 6th Field Ambulance.
 5648 Serjt. (Temp. Qmr.-Serjt.) E. F. Smith, M.M.
 86746 Lance-Cpl. H. J. Smith, 41st Stationary Hospital.
 76432 Cpl. (Acting Serjt.) W. C. Smith, 6th Mobile X-Ray Unit.
 66396 Lance-Cpl. S. P. Southcombe, 99th Field Ambulance.
 118260 Pte. E. Southern, 26th General Hospital.
 1827 Serjt. (Acting Qmr.-Serjt.) T. F. Spratt.
 59666 Cpl. S. C. Spreadbury, 41st Casualty Clearing Station.
 106345 Pte. A. G. Stallard, 106th Field Ambulance.
 72511 Serjt. R. J. Stapleton, 5th General Hospital.
 17568 Serjt.-Major E. Steele.
 997 Pte. (Acting Serjt.) A. Stillie.
 54268 Pte. W. Stobie, 11th Casualty Clearing Station.
 55852 Serjt. R. Stringfellow, 22nd General Hospital.
 25355 Serjt. W. G. Stunnell, 49th Casualty Clearing Station.
 45292 Pte. (Acting Cpl.) C. R. Swaffield.
 5034 Cpl. (Acting Lance-Serjt.) E. Tapril, 13th Field Ambulance.
 6308 Pte. J. W. Terrington.
 68666 Serjt. J. E. Thompson, 94th Field Ambulance.
 5803 Cpl. A. J. Tilbury.
 5107 Cpl. A. E. Traves, 2nd Casualty Clearing Station.
 15967 Serjt. W. T. Tringham.
 81612 Pte. (Acting Serjt.) J. Troup, 13th Convalescent Depot.
 35693 Serjt. (Acting Staff-Serjt.) W. J. Twidell.
 51212 Staff-Serjt. C. A. Vasey, 45th Casualty Clearing Station.
 90892 Cpl. (Acting Serjt.) H. E. Vincent.
 40289 Cpl. W. Walker, 12th Stationary Hospital.
 6873 Pte. L. Wallis, 3rd Field Ambulance.
 27093 Cpl. L. Walton, 41st Casualty Clearing Station.
 60524 Pte. (Acting Lance-Cpl.) W. E. Watson, 22nd Casualty Clearing Station.
 1014 Pte. (Temp. Serjt.) W. Weber.
 11156 Pte. (Temp. Serjt.) F. H. Weeks, attached 65th (W. Lan.) Field Ambulance.
 Royal Army Medical Corps (Territorial Force).
 71955 Serjt. H. J. Wells, 137th Field Ambulance.
 63634 Pte. E. Westall, 137th Field Ambulance.
 66047 Pte. T. L. Wheeler, 76th Field Ambulance.
 67180 Serjt. L. T. Whipp, 96th Field Ambulance.
 63899 Serjt. T. G. Whisker, 105th Field Ambulance.
 19149 Pte. (Temp. Cpl.) A. C. Whitbread.
 97369 Pte. H. V. White, 10th Casualty Clearing Station.
 89430 Serjt.-Major W. Whittington, 48th General Hospital.
 63760 Pte. W. Whittle, 113th Field Ambulance.
 72129 Cpl. A. T. Whybrew, 134th Field Ambulance.
 60558 Pte. F. C. Williams, 51st Field Ambulance.
 48064 Staff-Serjt. L. W. Williams, 130th Field Ambulance.
 8608 Pte. (Acting Cpl.) R. Williams.
 30967 Cpl. W. H. Williams, 20th Motor Ambulance Convoy.
 719 Serjt. A. Winckworth, 39th General Hospital.
 51999 Pte. G. E. Wood, attached 2/3rd (West Riding) Field Ambulance, Royal Army Medical Corps (Territorial Force).
 64782 Serjt. R. W. Wood, 100th Field Ambulance.
 89501 Pte. (Acting Cpl.) A. J. Woolford, 136th Field Ambulance.
 397 Cpl. (Temp. Serjt.) L. R. Young, 15th Advanced Depot Medical Stores.

ROYAL ARMY MEDICAL CORPS (SPECIAL RESERVE).

- Capt. (Acting Major) S. R. Armstrong, M.B.
 Capt. (Acting Major) R. G. Battersby, attached 93rd Field Ambulance.
 Capt. H. C. Bazett, M.C., M.B., F.R.C.S., attached Royal Air Force.
 Capt. E. Bramley, M.B., attached Headquarters, 12th Labour Group, Labour Corps.
 Capt. J. L. D. Buxton, attached 24th Battalion, Machine Gun Corps.
 Capt. (Acting Major) T. W. Clarke, M.C., 148th (R.N.) Field Ambulance.

Capt. W. H. Cornelius, attached 43rd Motor Ambulance Corps.
 Capt. W. J. F. Craig, M.B., attached 2nd Battalion, Royal Dublin Fusiliers.
 Capt. F. A. Duffield, M.B.
 Capt. (Acting Major) F. G. Foster, M.B., attached 77th Field Ambulance.
 Capt. (Acting Lieut.-Col.) W. R. Gardner, D.S.O., attached 138th Field Ambulance.
 Capt. (Acting Major) A. J. Gilchrist, M.C., attached 10th General Hospital.
 Capt. (Acting Major) B. Goldsmith.
 Capt. (Acting Lieut.-Col.) C. N. Gover, M.C., M.B., attached 96th Field Ambulance.
 Lieut. G. N. Groves, attached 11th Battalion, Royal Fusiliers.
 Capt. M. St. C. Hamilton, attached 1/5th Battalion, Gloucester Regiment (Territorial Force).
 Capt. (Acting Major) R. L. Horton, M.B., attached 11th Stationary Hospital.
 Capt. F. Jefferson, M.B.
 Capt. J. L. Kilbride, M.B., attached 1/24th Battalion, London Regiment.
 Capt. (Acting Major) D. M. Marr, M.B.
 Capt. (Acting Major) G. Marshall, M.B.
 Capt. (Acting Lieut.-Col.) W. H. L. McCarthy, D.S.O., M.C., attached 19th Field Ambulance.
 Capt. D. M. B. Mitchell.
 Capt. M. K. Nelson, attached Headquarters, 39th Brigade, Royal Garrison Artillery.
 (Capt. (Acting Major) H. D. Rollinson, M.D.
 Capt. (Acting Major) A. F. L. Shields, M.B., attached 142nd Field Ambulance.
 Capt. (Acting Major) G. H. Stevenson, M.C., M.B.
 Capt. (Acting Major) E. S. B. Tasker, M.C.
 Capt. (Acting Major) J. Walker, M.C., M.B.
 Capt. (Acting Major) W. J. Webster, M.C.
 Capt. (Acting Major) A. Wilson, M.C., M.B., attached Royal Air Force.
 Capt. T. Wilson, attached 1/7th Battalion, West Riding Regiment (Territorial Force).

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

Qmr. and Capt. H. G. Aldiss, 2/1st (Home Counties) Field Ambulance.
 Capt. G. W. McB. Andrew, 2/2nd (Home Counties) Field Ambulance.
 Major (Acting Lieut.-Col.) W. Archibald, M.D., 1/1st (South East) Mounted Brigade, Field Ambulance.
 Capt. R. A. Askins, M.D., 44th Sanitary Section.
 Major A. Ayre-Smith, M.D., 7th General Hospital.
 Capt. (Acting Major) H. T. Bates, M.B.
 Capt. (Acting Lieut.-Col.) A. Baxter, M.D., 2/2nd (East Lancashire) Field Ambulance.
 Capt. W. F. Bensted-Smith, 55th Casualty Clearing Station.
 Major (Acting Lieut.-Col.) G. N. Biggs, M.B.
 Capt. (Acting Major) E. J. Boome, M.B.
 Qmr. and Capt. C. W. Braithwaite, 2/2nd (Northumberland) Field Ambulance.
 Capt. A. M. Brown, M.B.
 Qmr. and Lieut. H. M. Browne, 2/3rd (West Riding) Field Ambulance.
 Capt. (Acting Lieut.-Col.) J. M. B. Bruce, 2/1st (East Lancashire) Field Ambulance.
 Capt. (Acting Lieut.-Col.) H. N. Burroughes, M.B., attached 2/2nd (S. Mid.) Field Ambulance.
 Lieut.-Col. and Brevet Col. J. P. Bush, C.M.G.
 Lieut.-Col. E. M. Callender, T.D., M.D., Commanding 53rd General Hospital.
 Major (Acting Lieut.-Col.) D. G. Campbell, 139th Field Ambulance.
 Major (Acting Lieut.-Col.) T. M. Carter, M.D., Commanding 7th Convalescent Depot.
 Capt. R. C. Clarke, M.B.
 Capt. (Acting Major) T. C. Clarke, M.C., M.B., 1/1st (West Lancashire) Field Ambulance.
 Capt. (Acting Major) F. Clayton, M.D., 20th General Hospital.
 Capt. L. Colledge, F.R.C.S.
 Capt. D. R. Cramb, M.B.
 Capt. (Acting Major) C. H. Crawshaw, M.B.
 Capt. J. D. Davidson.
 Capt. (Acting Major) R. G. Dixon, M.B., 58th Casualty Clearing Station.
 Capt. (Acting Major) G. W. Deeping, M.B., 2/2nd (East Lancashire) Field Ambulance.
 Capt. A. D. Downes, M.B., 1/1st (Low) Field Ambulance.
 Lieut.-Col. A. D. Ducat, T.D., M.B., 2/3rd (London) Field Ambulance.
 Major J. M. Duncan, M.D., 46th Stationary Hospital.
 Capt. (Acting Lieut.-Col.) W. Duncan, M.B., 54th Casualty Clearing Station.
 Capt. (Acting Major) J. F. Edmiston, M.B., 3/2nd (West Lancashire) Field Ambulance.
 Major A. Elliott, M.D., 53rd General Hospital.

- Lieut.-Col. C. I. Ellis, C.M.G., M.D., 46th Casualty Clearing Station.
 Capt. (Acting Major) R. Ellis, M.C., M.B., 13th Casualty Clearing Station.
 Capt. (Acting Major) J. Everidge, F.R.C.S.
 Major A. H. Falkner, attached 8th Battalion, Liverpool Regiment (Territorial Force).
 Capt. H. N. Fletcher, F.R.C.S.
 Capt. C. Forbes, M.B.
 Major M. G. Foster, M.D.
 Capt. (Acting Major) C. J. Fox, 6th Stationary Hospital.
 Capt. (Acting Lieut.-Col.) J. H. P. Fraser, M.C., M.B., attached 53rd Field Ambulance.
 Major W. H. Galloway.
 Capt. (Acting Major) H. J. Gorrie, 1/3rd (Highland) Field Ambulance.
 Major (Acting Lieut.-Col.) D. J. Graham, M.D., F.R.C.P., Commanding 58th General Hospital.
 Qmr. and Capt. E. M. Grierson, 1/3rd (Northumberland) Field Ambulance.
 Lieut.-Col. A. G. Hamilton, Welsh Border Mounted Brigade, Field Ambulance.
 Capt. F. G. Harper, M.C., M.D.
 Lieut.-Col. J. R. Harper, T.D., Commanding 14th Stationary Hospital.
 Qmr. and Capt. (Temp. Major) A. H. Hartshorn, attached Royal Engineers.
 Capt. L. Hawkes.
 Capt. W. R. H. Heddy, 47th Casualty Clearing Station.
 Capt. (Acting Major) R. Henry.
 Lieut.-Col. (Acting Col.) F. W. Higgs, M.D., 55th Casualty Clearing Station.
 Capt. W. H. Hill, M.D.
 Capt. (Acting Major) S. J. C. Holden, M.B.
 Capt. (Acting Major) A. J. Jex-Blake, M.B., F.R.C.P.
 Major (Acting Lieut.-Col.) F. W. Johnson, M.B., 2/2nd (N. Mid.) Field Ambulance.
 Capt. W. Johnstone, M.B., 38th Sanitary Section.
 Capt. (Acting Lieut.-Col.) E. Knight, M.B., 1/3rd (West Lancashire) Field Ambulance.
 Qmr. and Capt. G. Knowles, 2/2nd (Home Counties) Field Ambulance.
 Capt. R. A. Lennie, M.B., 1/1st (Lowlands) Field Ambulance.
 Qmr. and Lieut. W. T. Liddell, 1/2nd (Lowlands) Field Ambulance.
 Capt. (Acting Lieut.-Col.) A. W. B. Loudon, M.D., 3/2nd (West Lancashire) Field Ambulance.
 Capt. G. E. Loveday, M.B., 57th General Hospital.
 Capt. (Acting Major) H. A. Lucas, 5th General Hospital.
 Capt. (Acting Major) A. M. Mackay, M.B., 1/1st (East Lancashire) Field Ambulance.
 Capt. (Acting Major) H. A. MacMillan, M.C., M.B., 2/1st (N. Mid.) Field Ambulance.
 Capt. (Acting Major) I. C. Marshall, M.D.
 Major C. J. Martin, M.B.
 Capt. G. E. Martin, 3rd Casualty Clearing Station.
 Major S. Martyn, M.B., 24th General Hospital.
 Capt. E. R. Matthews, 57th Sanitary Section.
 Capt. (Temp. Lieut.-Col.) G. K. Maurice, M.C., 8th Field Ambulance.
 Capt. (Acting Lieut.-Col.) A. C. H. McCullugh, M.B., 2/2nd (Northumberland) Field Ambulance.
 Capt. J. C. W. Methven, 55th Casualty Clearing Station.
 Capt. (Acting Lieut.-Col.) J. Miller, M.C., 1/2nd (N. Mid.) Field Ambulance.
 Qmr. and Major W. M. Moreton, T.D., 1/1st (N. Mid.) Field Ambulance.
 Capt. (Acting Major) J. Morham, 108th Field Ambulance.
 Qmr. and Lieut. F. W. Newbould, 2/2nd (West Riding) Field Ambulance.
 Major D. C. L. Orton, 51st General Hospital.
 Capt. (Acting Major) W. R. Pierce, 41st Stationary Hospital.
 Capt. E. B. Pike.
 Qmr. and Capt. A. McK. Reid, 1/1st (Low.) Field Ambulance.
 Major (Acting Lieut.-Col.) A. J. D. Riddett, 2/1st (Wessex) Field Ambulance.
 Major (Acting Lieut.-Col.) H. B. Roderick, M.D.
 Qmr. and Capt. C. T. Ross, 1/1st (West Riding) Field Ambulance.
 Qmr. and Capt. W. H. Russell, 6th (London) Field Ambulance.
 Capt. (Acting Lieut.-Col.) P. T. Rutherford, 2/3rd (Wessex) Field Ambulance.
 Capt. (Acting Major) C. F. M. Saint, M.D., F.R.C.S.
 Qmr. and Capt. C. D. C. Saker, 46th Casualty Clearing Station.
 Capt. (Acting Lieut.-Col.) D. J. Scott, M.C., 1/2nd (Low.) Field Ambulance.
 Lieut.-Col. G. C. E. Simpson, M.B., F.R.C.S., 34th Casualty Clearing Station.
 Capt. (Acting Lieut.-Col.) W. Simpson, attached 50th Casualty Clearing Station.
 Capt. T. S. Slessor, M.B.
 Capt. T. H. Somervell, 34th Casualty Clearing Station.
 Capt. R. W. E. Stickings.
 Capt. (Acting Major) W. Stobie, M.B., 41st Casualty Clearing Station.

Qmr. and Capt. J. T. Stokes, 53rd Casualty Clearing Station.
 Capt. (Acting Major) R. W. Swayne, M.B., 50th Casualty Clearing Station.
 Qmr. and Capt. A. L. Taylor, 56th General Hospital.
 Qmr. and Capt. D. P. Taylor, 56th Casualty Clearing Station.
 Capt. (Acting Major) E. S. Taylor, M.B., 54th Casualty Clearing Station.
 Capt. (Acting Major) A. G. G. Thompson, 12th Sanitary Section.
 Major (Acting Lieut.-Col.) W. A. Thompson, 1/3rd (Northumberland) Field Ambulance.
 Capt. W. S. Tresawna, M.B., 5th British Red Cross Stationary Hospital.
 Qmr. and Capt. R. J. Tytler.
 Capt. (Acting Major) C. A. Webster, 1/2nd (East Lancashire) Field Ambulance.
 Lieut.-Col. and Brevet Col. F. H. Westmacott, F.R.C.S., Commanding 57th General Hospital.
 Capt. (Acting Major) K. D. Wilkinson, M.B., 47th Casualty Clearing Station.
 Capt. (Acting Major) F. E. Withers.
 Capt. J. M. Wyatt, attached Headquarters, 80th Wing, Royal Air Force.
 Capt. (Acting Major) A. L. Yates, M.C., M.D.
 545923 Serjt. (Acting Staff-Serjt.) F. Q. Barry, 82nd Sanitary Section.
 421077 Pte. G. Beardsmore, 1/3rd (N. Mid.) Field Ambulance.
 461180 Qmr.-Serjt. J. J. Bicknell, 25th (Wessex) Field Ambulance.
 456036 Staff-Serjt. W. Bishop, 1/1st (S. West) Mounted Brigade, Field Ambulance.
 492047 Staff-Serjt. J. L. Blair, 1/1st (S. East) Mounted Brigade, Field Ambulance.
 356069 Serjt. F. Bond, 64th Casualty Clearing Station.
 403555 Serjt. W. Bradley, attached Headquarters, XI Corps.
 339474 Serjt. H. Bransom, 63rd (West Lancashire) Field Ambulance.
 493060 Pte. C. Brisley, 2/1st (H.C.) Field Ambulance.
 435118 Pte. P. Britten, 2/1st (S. Mid.) Field Ambulance.
 423025 Pte. (Acting Lance-Cpl.) J. W. Brooks, 53rd Casualty Clearing Station.
 390495 Pte. H. H. Brown, 1/3rd (Northumberland) Field Ambulance.
 386475 Pte. (Acting Cpl.) K. I. Brown, 2/2nd (Northumberland) Field Ambulance.
 356008 Pte. A. Calligan, 64th Casualty Clearing Station.
 527688 Pte. (Acting Serjt.) F. Cheeld, 58th (London) Sanitary Section.
 461386 Pte. E. F. Chiverton, 2/3rd (Wessex) Field Ambulance.
 Capt. (Acting Major) W. G. McKenzie, M.C., 2/2nd (Wessex) Field Ambulance.
 407075 Cpl. A. W. Clegg, 58th Casualty Clearing Station.
 441132 Pte. (Acting Lance-Cpl.) H. L. Clinton, S. Mid. Casualty Clearing Station.
 461227 Pte. T. M. Cobern, 26th (Wessex) Field Ambulance.
 417494 Pte. N. E. Coghlan, 1/1st (N. Mid.) Field Ambulance.
 493567 Pte. H. Curd, 2/1st (H.C.) Field Ambulance.
 527734 Pte. H. A. Edge, 45th Sanitary Section.
 368361 Pte. E. E. A. Edwards, attached 44th Motor Ambulance Convoy.
 459049 S. M. R. A. Elliott, 2/2nd (Wessex) Field Ambulance.
 493494 Pte. A. B. Esland, 2nd (Home Counties) Field Ambulance.
 305054 Pte. (Acting Lance-Cpl.) W. Fawns, 1/3rd (High.) Field Ambulance.
 500090 Pte. J. W. Field, 2nd Eastern General Hospital.
 350122 Pte. H. J. Fitzwilliam, 1/1st (East Lancashire) Field Ambulance.
 421323 Pte. (Acting Lance-Cpl.) J. Fletcher, 2/3rd (N. Mid.) Field Ambulance.
 527042 Staff-Serjt. G. H. Fowler, 1st (London) Sanitary Section.
 352401 Pte. L. Francis, 1/2nd (East Lancashire) Field Ambulance.
 540060 Pte. C. E. Gillard, 55th Casualty Clearing Station.
 417032 Pte. W. Gillingham, 1/1st (N. Mid.) Field Ambulance.
 307001 Pte. J. Gowans, 51st Casualty Clearing Station.
 350176 Pte. C. Hamilton, 1/1st (East Lancashire) Field Ambulance.
 461342 Staff-Serjt. (Acting Qmr.-Serjt.) L. F. Harding, 2/3rd (Wessex) Field Ambulance.
 448058 Pte. W. E. Harding, 61st Sanitary Section.
 423021 Pte. (Acting Lance-Cpl.) G. W. Hardy, 53rd Casualty Clearing Station.
 301342 Serjt. H. Hay, M.M., 89th Field Ambulance.
 437547 Pte. H. A. Haywood, 1/2nd (S. Mid.) Field Ambulance.
 497232 Pte. T. A. Higgins, 2/3rd (Home Counties) Field Ambulance.
 395017 Cpl. W. E. Hill, 50th Sanitary Section.
 356006 Staff-Serjt. G. F. Holgate, 64th Casualty Clearing Station.
 528172 Pte. E. Holmes, 1st (London) Sanitary Section.
 352048 Serjt. H. Horne, M.M., 1/2nd (East Lancashire) Field Ambulance.
 457370 Cpl. H. H. Hosegood, attached Headquarters, 58th (London) Division.
 527986 Serjt. (Acting Staff-Serjt.) G. T. Howard, 81st Sanitary Section.
 417122 Pte. C. Hudson, 1/1st (N. Mid.) Field Ambulance.
 337587 Pte. A. J. Hughes, 2/2nd (Northumberland) Field Ambulance.
 423075 Serjt. W. H. Hunt, 50th Casualty Clearing Station.

- 392144 Pte. B. Johnson.
 403624 Pte. A. E. Killerby, 2/2nd (West Riding) Field Ambulance.
 510115 Serjt. L. G. Lane, 2/2nd (London) Field Ambulance.
 303181 Serjt. F. Ledingham, 1/2nd (High.) Field Ambulance.
 508347 Pte. J. J. Love, 2/1st (London) Field Ambulance.
 318045 Serjt. T. Maclean, 1/2nd (Low.) Field Ambulance.
 512016 Qmr.-Serjt. A. B. Marshall, 3rd (City of London) Field Ambulance, attached Headquarters, 14th Division.
 318342 Staff-Qmr.-Serjt. J. G. McDowall, 1/2nd (Low.) Field Ambulance.
 310024 Serjt. J. McKenzie, 51st Sanitary Section.
 320139 Pte. J. McKenzie, 1/3rd (Low.) Field Ambulance.
 457154 Pte. (Acting Lance-Cpl.) D. R. McMaster, 2/1st (Wessex) Field Ambulance.
 459074 Serjt. J. S. Moore, 25th (Wessex) Field Ambulance.
 392131 Serjt. (Acting Staff-Serjt.) J. G. Mullen, (Northumberland Battalion) Casualty Clearing Station.
 315042 Pte. T. H. Overend, 1/1st (Low.) Field Ambulance.
 339027 Pte. (Acting Lance-Cpl.) H. M. Owens, 98th Field Ambulance.
 545050 Cpl. (Acting Serjt.) W. H. Palmer, 2nd (London) Sanitary Company.
 318315 Cpl. A. Parker, 1/2nd (Low.) Field Ambulance.
 337359 Serjt. T. Parker, 2/1st (West Lancashire) Field Ambulance.
 441110 Cpl. C. I. Payne, 61st Casualty Clearing Station.
 540081 Pte. E. E. Pearce, 55th Casualty Clearing Station.
 392068 Serjt. A. L. Pfaff, 50th Casualty Clearing Station.
 463072 Qmr.-Serjt. W. H. Pook, 46th Casualty Clearing Station.
 417417 Cpl. (Acting Lance-Serjt.) S. G. Potter, 2/1st (N. Mid.) Field Ambulance.
 423105 Pte. C. E. Powell, 59th Casualty Clearing Station.
 350226 Cpl. (Acting Serjt.) S. Ramsbottom, 2/1st (East Lancashire) Field Ambulance, attached Headquarters, 66th (East Lancashire) Division.
 421147 Pte. W. Ratcliffe, 1/3rd (N. Mid.) Field Ambulance.
 352568 Pte. F. Redhead, 2/2nd (East Lancashire) Field Ambulance.
 339498 Staff-Serjt. E. V. Roberts, 3/2nd (West Lancashire) Field Ambulance.
 534341 Serjt. D. Rockley, 12th Mobile Laboratory.
 536095 Pte. S. A. Salisbury, 5th (London) Field Ambulance.
 437511 Pte. G. N. Seales, 2/2nd (S. Mid.) Field Ambulance.
 499013 Cpl. (Acting Serjt.) B. P. Searle, attached 14th Advanced Depot Medical Stores.
 403561 Pte. (Acting Lance-Cpl.) W. Shaw, 1/2nd (West Riding) Field Ambulance.
 419049 Serjt. E. L. Simpson, 1/2nd (N. Mid.) Field Ambulance.
 303399 Pte. (Acting Serjt.) J. Simpson, 89th Field Ambulance.
 412013 Cpl. (Acting Serjt.) H. B. Slack, 49th Sanitary Section.
 401330 Serjt. F. H. Slater, 1/1st (West Riding) Field Ambulance.
 301410 Pte. (Acting Serjt.) J. Smith, 2/1st (High.) Field Ambulance.
 401242 Cpl. A. E. Spedding, 2/1st (West Riding) Field Ambulance.
 301221 Lance-Cpl. G. Stephen, 89th Field Ambulance.
 419001 Qmr.-Serjt. (Temp. Serjt.-Major) A. W. Thorne, 2/2nd (N. Mid.) Field Ambulance.
 538288 Cpl. E. H. Trotman, 6th (London) Field Ambulance, attached Headquarters, 47th (London) Division.
 54100 Serjt.-Major H. A. Walden, 54th General Hospital.
 457319 Serjt. F. H. Walter, 2/1st (Wessex) Field Ambulance.
 388507 Pte. (Acting Cpl.) R. A. Ward, attached Headquarters, 50th (Northumberland) Division (Territorial Force).
 417190 Pte. (Acting Cpl.) J. Watts, attached Headquarters, 46th (N. Mid.) Division.
 540046 Pte. W. S. Wellbank, 54th Casualty Clearing Station.
 538017 Serjt. P. B. Wheeler, 4th (London) Field Ambulance.
 435265 Cpl. I. Whitehouse, 2/1st (S. Mid.) Field Ambulance.
 352199 Serjt. (Temp. Serjt.-Major) F. Williams, 2/2nd (East Lancashire) Field Ambulance.
 419477 Serjt.-Major W. C. Williams, 1/2nd (N. Mid.) Field Ambulance.
 403303 Cpl. E. Williamson, 2nd (West Riding) Field Ambulance.
 405150 Pte. H. Williamson, 2/3rd (West Riding) Field Ambulance.
 441033 Staff-Serjt. H. Willmore, 56th Casualty Clearing Station.
 423052 Pte. A. E. Wilson, 53rd Casualty Clearing Station.
 495293 Pte. E. H. Wilson, 7th Casualty Clearing Station.
 545238 Pte. J. W. Wilton, 23rd Sanitary Section.
 534303 Cpl. A. G. C. Witherden, 4th (London) Field Ambulance.
 337189 Pte. D. E. Wood, 87th Field Ambulance.
 448051 Pte. (Acting Serjt.) J. H. Wright, 61st Sanitary Section.
 514015 Pte. A. J. S. Yates, 63rd Casualty Clearing Station.

War Office,
July 11, 1919.

The following is a continuation of Sir D. Haig's dispatch of March 16, 1919, submitting names deserving of special mention :—

CANADIAN FORCES.

Commands and Staff.

Col. J. M. Elder, C.M.G., Canadian Army Medical Corps.
Major A. L. Jones, M.C., Canadian Army Medical Corps.
Col. C. A. Peters, D.S.O., Canadian Army Medical Corps.
Brig.-Gen. A. E. Ross, C.B., C.M.G., Canadian Army Medical Corps.
Col. R. M. Simpson, D.S.O., Canadian Army Medical Corps, attached Headquarters
2nd Cavalry Division.
Lieut.-Col. (Acting Col.) C. P. Templeton, D.S.O., Canadian Army Medical Corps.
Major E. L. Warner, Canadian Army Medical Corps.

Army Medical Corps.

Capt. W. F. Abbott, M.C., 9th Field Ambulance.
Capt. (Acting Major) M. H. Allen, attached Headquarters, Canadian Corps.
Lieut.-Col. W. H. K. Anderson, D.S.O., 13th Field Ambulance.
Major (Acting Lieut.-Col.) W. A. G. Bauld, D.S.O., Canadian Cavalry Field Ambulance.
Major (Acting Lieut.-Col.) A. E. H. Bennett, 1st Casualty Clearing Station.
Capt. H. Black, attached 21st Battalion East Ontario Regiment.
Lieut.-Col. G. J. Boyce, D.S.O., 1st Field Ambulance.
Qmr. and Hon. Capt. J. A. Brook, 12th Field Ambulance.
Capt. R. S. R. Carruthers, 3rd Casualty Clearing Station.
Capt. H. E. Connolly.
Capt. C. K. Dowson, 1st Field Ambulance.
Col. L. Drum, Commanding 3rd General Hospital.
Major A. W. M. Ellis.
Capt. J. M. Fowler.
Major G. W. Hall, D.S.O., 12th Field Ambulance.
Major (Acting Lieut.-Col.) R. H. M. Hardy, M.C., 6th Field Ambulance.
Lieut.-Col. E. V. Hogan.
Major K. E. Hollis.
Capt. (Acting Major) L. F. Jones.
Lieut.-Col. D. P. Kappele, D.S.O., 5th Field Ambulance.
Major B. E. Kelly, D.S.O., 9th Field Ambulance.
Lieut.-Col. T. M. Leask, D.S.O., 10th Field Ambulance.
Major A. F. Macaulay.
Lieut.-Col. R. H. Macdonald, M.C., 4th Field Ambulance.
Major J. A. MacMillan, attached Headquarters, Canadian Corps.
Capt. D. C. Malcolm, M.C., 8th Field Ambulance.
Qmr. and Hon. Capt. H. A. Marshall.
Capt. J. F. S. Marshall, M.C., 8th Field Ambulance.
Capt. H. W. Martin.
Capt. R. B. Mitchell, 4th Casualty Clearing Station.
Lieut.-Col. H. E. Munroe, O.B.E., attached 7th Stationary Hospital.
Major E. A. Neff, 11th Field Ambulance.
Capt. J. I. O'Connell.
Capt. G. P. Parker, 5th Field Ambulance.
Major S. Paulin, D.S.O., 11th Field Ambulance.
Major (Acting Lieut.-Col.) G. A. Platt, 7th General Hospital.
Lieut.-Col. C. H. Reason, D.S.O.
Capt. J. W. Reynolds, 2nd Field Ambulance.
Capt. W. A. Richardson, 2nd Sanitary Section.
Major R. B. Robertson, 1st Casualty Clearing Station.
Major (Acting Lieut.-Col.) E. R. Selby, 8th Field Ambulance.
Major P. D. Stewart, 8th Stationary Hospital.
Major S. J. Streight, 2nd Casualty Station.
Major G. W. Treleaven, D.S.O., M.C., 4th Field Ambulance.
Capt. J. C. Tull, 1st Casualty Clearing Station.
Major W. H. Tytler.
Capt. H. L. Walker.
Qmr. and Hon. Capt. J. S. Ward, 3rd Casualty Clearing Station.
Temp. Major H. J. Williamson, 2nd General Hospital.

Lieut.-Col. F. W. E. Wilson.

Lieut.-Col. F. A. Young, 3rd Casualty Clearing Station.

AUSTRALIAN IMPERIAL FORCE.

Commands and Staff.

Col. G. W. Barber, C.M.G., D.S.O., Australian Army Medical Corps.

Col. M. H. Downey, D.S.O., Australian Army Medical Corps.

Col. T. P. Dunhill, Australian Army Medical Corps.

Major (Acting Lieut.-Col.) J. A. James, Australian Army Medical Corps.

Col. A. H. Marks, D.S.O., Australian Army Medical Corps.

Col. A. E. Shepherd, D.S.O., Australian Army Medical Corps.

Army Medical Corps.

Lieut.-Col. J. K. Adey, O.B.E., 3rd Casualty Clearing Station.

Capt. B. McN. Beith, 3rd General Hospital.

Capt. (Temp. Major) G. Bell.

Major J. C. Campbell, D.S.O., 7th Field Ambulance.

Major L. R. Cook, 6th Field Ambulance.

Major D. D. Coutts, D.S.O., 6th Field Ambulance.

Major R. F. Craig, D.S.O., 15th Field Ambulance.

Major A. S. Curtin, 4th Field Ambulance.

Major A. P. Drummond, 5th Field Ambulance.

Lieut.-Col. and Brevet Colonel W. L. E. Eames, C.B., (Temp. Lieut.-Col. Royal Army Medical Corps).

Major J. W. Farrar, 3rd General Hospital.

Lieut.-Col. P. Fiaschi.

Capt. H. W. Franklands, 4th Sanitary Section.

Lieut.-Col. A. H. Gibson, 1st Casualty Clearing Station.

Capt. J. W. Grieve, attached 6th Infantry Battalion.

Major D. H. B. Lawton.

Lieut.-Col. H. B. Lewers, O.B.E., 11th Field Ambulance.

Capt. E. I. Littlejohn, 3rd Casualty Clearing Station.

Col. F. A. Maguire, D.S.O., 3rd Field Ambulance.

Major L. May, D.S.O., M.C., attached 11th Infantry Battalion.

Capt. A. L. McLean, M.C.

Capt. F. Meldrum, 6th Field Ambulance.

Major (Temp. Lieut.-Col.) J. R. Muirhead, 5th Field Ambulance.

Major R. B. Norths, attached 4th Australian Division Train.

Capt. P. J. F. O'Shea, D.S.O., M.C., attached 8th Infantry Battalion.

Capt. C. A. Oxley.

Capt. R. L. Park, 5th Field Ambulance.

Major J. S. Smyth, 9th Field Ambulance.

Major M. V. Southey, 1st Field Ambulance.

Major (Temp. Lieut.-Col.) V. O. Stacy, 2nd Casualty Clearing Station.

Lieut.-Col. C. W. Thompson, 14th Field Ambulance.

Capt. W. J. Trehwella, 2nd General Hospital.

Major C. T. Turner, 3rd General Hospital.

Major F. T. Wheatland, 10th Field Ambulance.

Major K. M. Whiting, 12th Field Ambulance.

Major H. H. Willis, 3rd Field Ambulance.

Lieut.-Col. F. C. Wooster, 13th Field Ambulance.

NEW ZEALAND FORCE.

Medical Corps.

Capt. P. A. Ardagh, D.S.O., M.C., attached 1st Battalion Auckland Regiment.

Major F. T. Bowerbank.

Capt. E. M. Finlayson, 3rd Field Ambulance.

Capt. P. G. Horsburgh, attached 3rd Battalion New Zealand Rifle Brigade.

Major (Temp. Lieut.-Col.) P. J. Jory, M.B., attached Headquarters, 2nd Brigade, New Zealand Field Artillery.

Capt. J. Mitchell, 2nd Field Ambulance.

Lieut.-Col. J. H. Neil, D.S.O., 3rd Field Ambulance.

SOUTH AFRICAN FORCE.

Medical Corps.

Capt. J. Drummond.

Capt. W. L. Gordon, 1st General Hospital.

Lieut.-Col. G. R. Thomson, Commanding 1st General Hospital.

Lieut.-Col. G. H. Usmar, attached Royal Army Medical Corps.

War Office,
July 23, 1919.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Warrant Officers, Non-Commissioned Officers and Men:—

BAR TO MILITARY MEDAL.

53424 Serjt. A. Todd, M.M., 7th Field Ambulance, Royal Army Medical Corps (Cowdenbeath). (M.M. gazetted February 19, 1917.)

510338 Pte. (Acting Lance-Cpl.) A. J. Bates, M.M., Royal Army Medical Corps (Catford). (M.M. gazetted July 18, 1919.)

301052 Pte. (Acting Cpl.) P. M. Morrison, M.M., 2/1st Field Ambulance, Royal Army Medical Corps (Aberdeen). (M.M. gazetted February 23, 1918.)

405142 Pte. S. Barker, M.M., 76th Field Ambulance, Royal Army Medical Corps (Sheffield).

46538 Cpl. D. Philip, M.M., 5th Field Ambulance, Royal Army Medical Corps (Glasgow). (M.M. gazetted March 13, 1918.)

2142 Cpl. (Acting Serjt.) E. C. Taylor, M.M., 12th Field Ambulance, Royal Army Medical Corps (Brixton). (M.M. gazetted July 16, 1918.)

401024 Pte. T. B. Haley, M.M., 1/1st Field Ambulance, Royal Army Medical Corps (Leeds). (M.M. gazetted September 13, 1918.)

48586 Cpl. T. J. Jones, M.M., 130th Field Ambulance, Royal Army Medical Corps (Pontypridd).

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for bravery in the field to the undermentioned Warrant Officers, Non-Commissioned Officers and Men:—

ROYAL ARMY MEDICAL CORPS.

508059 Serjt.-Major F. A. Smith, 1st Field Ambulance (Kensal Rise).

417003 Staff-Serjt. S. V. Blount, 1st Field Ambulance (Derby).

352031 Staff-Serjt. T. S. Murgatroyd, 2nd Field Ambulance (Manchester).

354064 Serjt. J. Birchall, 3rd Field Ambulance (Bury).

1734 Serjt. W. Dixon, 129th Field Ambulance (Preston).

18280 Serjt. F. Golden, 100th Field Ambulance (Southampton).

24734 Serjt. G. J. Grosse, 3rd Field Ambulance (London, S.E.).

401330 Serjt. F. H. Slater, 1st Field Ambulance (Matlock).

435408 Serjt. H. Smith, 1st Field Ambulance (West Bromwich).

18289 Serjt. L. Tweed, 19th Field Ambulance (Hamilton).

66658 Cpl. G. Annand, 140th Field Ambulance (Reading).

26681 Cpl. H. G. Barker, 16th Field Ambulance (Tadmorton).

301268 Cpl. A. Benzie, 1st Field Ambulance (Aberdeen).

5686 Cpl. F. C. Brookes, 90th Field Ambulance (West Norwood).

386196 Cpl. (Acting Serjt.) W. Clark, 1st Field Ambulance (Newcastle).

55194 Cpl. L. W. Doughty, 33rd Field Ambulance (Hixon).

368026 Cpl. A. E. John, 2nd Field Ambulance (Swansea).

495 Cpl. W. McFarland, 4th Field Ambulance (Belfast).

9027 Cpl. P. T. Pronger, D.C.M., 4th Field Ambulance (Monchelsea).

17869 Cpl. (Acting Serjt.) W. Pulling, 15th Field Ambulance (Portsmouth).

305118 Cpl. R. K. Reekie, 1st Field Ambulance (Cowdenheath).

403117 Cpl. G. F. Thomas, 2nd Field Ambulance (Leeds).

354207 Cpl. (Acting Serjt.) S. Thornhill, 3rd Field Ambulance (Denton).

30411 Cpl. (Acting Serjt.) G. Timm, 75th Field Ambulance (Tottenham).

439139 Cpl. A. S. Treasure, 3rd Field Ambulance (Bristol).

388056 Cpl. H. Wood, 2nd Field Ambulance (Durham).

45803 Pte. H. Allott, 33rd Field Ambulance (Rotherham).

53147 Pte. S. A. Apps, 36th Field Ambulance (Rickmansworth).

50197 Pte. W. Armitage, 77th Field Ambulance (Ashton-under-Lyne).

39310 Pte. (Acting Serjt.) B. P. Arnold, 49th Field Ambulance (Birmingham).

- 341059 Pte. J. Ashcroft, 64th Field Ambulance (St. Helens).
 512269 Pte. P. Bailey, 2nd Field Ambulance (Ashwell).
 510446 Pte. (Acting Cpl.) E. Banham, 2nd Field Ambulance (Swiftham).
 45815 Pte. W. Barker, 33rd Field Ambulance (Spennymoor).
 62007 Pte. C. S. Barnes, 91st Field Ambulance (Widnes).
 320020 Pte. R. Benge, 5th Field Ambulance (Willesden).
 77349 Pte. E. Binks, 99th Field Ambulance (Longwood).
 101068 Pte. R. H. Birtwistle, 12th Field Ambulance (Bury).
 403446 Pte. J. K. Booker, 2nd Field Ambulance (Leeds).
 403410 Pte. A. Boshell, 2nd Field Ambulance (Leeds).
 512491 Pte. D. A. H. Bowditch, 3rd Field Ambulance (South Norwood).
 69192 Pte (Lance-Cpl.) P. J. Broadbridge, 91st Field Ambulance (Willesden).
 437448 Pte. A. Brockhouse, 2nd Field Ambulance (Birmingham).
 372183 Pte. J. H. C. Butler-Dowers, 3rd Field Ambulance (Bargoed).
 43355 Pte. A. S. Campbell, 16th Field Ambulance (Kirkcudbright).
 68322 Pte. (Acting Lance-Cpl.) H. Campbell, 16th Field Ambulance (Rotherham).
 512394 Pte. F. Carter, 3rd Field Ambulance (London, W.).
 403500 Pte. S. B. Chadwick, 2nd Field Ambulance (Leeds).
 31650 Pte. H. J. Chaplin, 77th Field Ambulance (Woking).
 78832 Pte. W. E. Christall, 16th Field Ambulance (Liverpool).
 46452 Pte. P. H. Clarke, 37th Field Ambulance (Willesden).
 390553 Pte. J. Clayton, 3rd Field Ambulance (Hull).
 386337 Pte. T. Cleugh, 1st Field Ambulance (Royton-on-Tyne).
 104184 Pte. J. Cogill, 54th Field Ambulance (Nelson).
 6622 Pte. J. Comish, 10th Field Ambulance (Liverpool).
 449020 Pte. C. M. Costigan, 10th Field Ambulance (Oxford).
 11780 Pte. C. H. Crump, 38th Field Ambulance (Walsall).
 59305 Pte. R. F. Dagger, 12th Field Ambulance (Preston).
 519239 Pte. F. A. Davis, 2nd Field Ambulance (West Kensington).
 403295 Pte. A. J. Dawson, 2nd Field Ambulance (Leeds).
 354372 Pte. A. Day, 3rd Field Ambulance (Manchester).
 93200 Pte. W. J. Denance, 19th Field Ambulance (Cardurdin).
 66953 Pte. A. L. Didymus, 138th Field Ambulance (Salisbury).
 303124 Pte. (Acting Lance-Cpl.) T. Donald, 2nd Field Ambulance (Aberdeen).
 512080 Pte. P. R. Dorrington, 3rd Field Ambulance (Islington).
 354509 Pte. T. Dorrington, 3rd Field Ambulance (Manchester).
 512107 Pte. J. E. J. Douch, 3rd Field Ambulance (Enfield).
 8849 Pte. A. Dudley, 19th Field Ambulance (Stratford).
 81242 Pte. W. Erskine, 75th Field Ambulance (Dunfermline).
 1316 Pte. E. Evans (Battersea).
 301533 Pte. C. Farquhar, 1st Field Ambulance (Longside).
 49251 Pte. H. Folwell, 37th Field Ambulance (Towcester).
 54816 Pte. J. P. Ford, 75th Field Ambulance (Cork).
 19255 Pte. H. L. Foster (Hendon).
 89667 Pte. A. W. Francis, 105th Field Ambulance (Bloomsbury).
 45859 Pte. (Acting Serjt.) H. W. Gardner, 33rd Field Ambulance (Methil).
 39849 Pte. R. Gee, 77th Field Ambulance (Oldham).
 59136 Pte. T. H. Giff, 138th Field Ambulance (Belfast).
 322056 Pte. N. Glass, 1st Field Ambulance (Glasgow).
 42940 Pte. A. W. Godart, 76th Field Ambulance (Bow).
 388339 Pte. W. Grant, 2nd Field Ambulance (Waterhouses).
 40660 Pte. T. Gregory, 76th Field Ambulance (Hyde).
 510410 Pte. R. S. Hall, 2nd Field Ambulance (Brixton).
 24913 Pte. A. Hardacre, 134th Field Ambulance (Halifax).
 100982 Pte. J. R. Harper, 37th Field Ambulance (Dudley).
 1935 Pte. F. Harple, 9th Field Ambulance (Fenton).
 41544 Pte. H. J. Hitchcock, 55th Field Ambulance (Redditch).
 136296 Pte. A. Hodgkinson, 1st Field Ambulance (Bradford).
 35822 Pte. H. Holton, 10th Field Ambulance (Birmingham).
 128767 Pte. D. Honan, 91st Field Ambulance (Market Weighton).
 508373 Pte. F. Hook, 1st Field Ambulance (Bexley Heath).
 1766 Pte. W. S. Hook, 10th Field Ambulance (Portsmouth).
 49728 Pte. W. Horrocks, 75th Field Ambulance (Chorley).
 388367 Pte. A. Hudspeth, 2nd Field Ambulance (Chester-le-Street).
 35979 Pte. G. H. Hyde, 35th Field Ambulance (Birmingham).
 401344 Pte. J. T. Hurtle, 1st Field Ambulance (Leeds).
 19955 Pte. (Acting Cpl.) E. W. Jefferies, 30th M.A.C. (Preston).
 508052 Pte. D. A. Johns, 1st Field Ambulance (Hampstead).

- 81864 Pte. J. C. Kelly, 75th Field Ambulance (Longport).
 316442 Pte. R. B. Kinloch, 1st Field Ambulance (Glasgow).
 51258 Pte. R. Laing, 77th Field Ambulance (Croydon).
 388550 Pte. W. M. Lawes, 2nd Field Ambulance (Dunston-on-Tyne).
 403425 Pte. H. Lickess, 2nd Field Ambulance (Leeds).
 435507 Pte. F. H. Lowe, 1st Field Ambulance (Birmingham).
 88639 Pte. A. W. McBean, 38th Field Ambulance (Inverness).
 11457 Pte. (Acting Serjt.) J. McCann, 5th Field Ambulance (Belfast).
 93847 Pte. T. D. McKenzie, 1st Field Ambulance (Leith).
 21352 Pte. M. McManus, 36th Field Ambulance (South Shields).
 305284 Pte. A. M. Mackie, 3rd Field Ambulance (Dundee).
 8195 Pte. J. Macro, 129th Field Ambulance (Colne).
 102423 Pte. E. A. Mansbridge, 10th Field Ambulance (Weston-super-Mare).
 101554 Pte. W. H. Mealing, 77th Field Ambulance (Bristol).
 20170 Pte. T. L. Meredith, 19th Field Ambulance (Ebbw Vale).
 112667 Pte. A. Mitchell, 36th Field Ambulance (Erith).
 305223 Pte. G. N. Moore, 3rd Field Ambulance (Dundee).
 435190 Pte. E. M. Moran, 1st Field Ambulance (Saltley).
 47463 Pte. G. W. Mortlock, 11th Field Ambulance (E. Haverhill).
 398549 Pte. J. D. Morton, 3rd Field Ambulance (Durham).
 38631 Pte. J. Murray, 10th Field Ambulance (Leigh).
 555 Pte. J. Neal, 11th Field Ambulance (Kettering).
 386168 Pte. M. Noble, 1st Field Ambulance (E. Newcastle).
 337654 Pte. S. Ord, 148th Field Ambulance (Southwark).
 41096 Pte. (Lance-Cpl.) W. Palmer, attached 1/2nd (High) Field Ambulance (Belfast).
 42376 Pte. W. Phillips, 12th Field Ambulance (Redditch).
 388579 Pte. J. S. Pickering, 2nd Field Ambulance (Alston).
 341505 Pte. H. Piggott, attached 1/1st Field Ambulance (St. Helens).
 29536 Pte. A. G. Pointer, 105th Field Ambulance (Greenwich).
 37571 Pte. G. H. Pottington, 55th Field Ambulance (Fittleworth).
 388349 Pte. J. W. Preston, 2nd Field Ambulance (E. Gateshead).
 28814 Pte. F. Redfearn (Dewsbury).
 390504 Pte. (Acting Lance-Cpl.) A. Richardson, 3rd Field Ambulance (Hull).
 117482 Pte. S. N. Roberts, 38th Field Ambulance (East Ham).
 386485 Pte. W. Rutherford, 1st Field Ambulance (Durham).
 403234 Pte. J. Senior, 2nd Field Ambulance (Leeds).
 20390 Pte. (Acting Lance-Cpl.) L. T. Sillay, 12th Field Ambulance (Bristol).
 3014 Pte. J. G. Smith, 1st Field Ambulance (Aberdeen).
 47291 Pte. M. F. Smith, 77th Field Ambulance (Bournemouth).
 301500 Pte. W. Smith, 1st Field Ambulance (Aberdeen).
 38448 Pte. S. Styler, 38th Field Ambulance (Worcester).
 372274 Pte. A. H. Telling, 36th Field Ambulance (Newport, Mon.).
 42271 Pte. J. Thomas, 19th Field Ambulance (Nantymoel).
 44750 Pte. J. R. Thompson, 35th Field Ambulance (E. Sunderland).
 401047 Pte. J. Tillotson, 1st Field Ambulance (Leeds).
 77603 Pte. W. E. Tilston (Fishpool).
 24542 Pte. W. Tomlinson, 10th Field Ambulance (Mansfield).
 34335 Pte. W. Towell (Dromore).
 117469 Pte. A. Townend, 38th Field Ambulance (Golcar).
 305066 Pte. J. B. Towns, 3rd Field Ambulance (Dundee).
 10226 Pte. W. Tozer, 54th Field Ambulance (Guernsey).
 72935 Pte. E. Turk, 37th Field Ambulance (Twickenham).
 386252 Pte. A. R. Vest, 1st Field Ambulance (E. Newcastle).
 341378 Pte. B. Walton, 64th Field Ambulance (St. Helens).
 301128 Pte. A. Warden, 2nd Field Ambulance (Aberdeen).
 33195 Pte. A. E. Warren, 9th Field Ambulance (Dover).
 350084 Pte. F. W. West, 2nd Field Ambulance (Manchester).
 73516 Pte. H. White, 76th Field Ambulance (Chesterfield).
 66637 Pte. J. White, 101st Field Ambulance (Worcester).
 364082 Pte. A. Williams, 3rd Field Ambulance (E. Newport).
 32686 Pte. A. P. Willson, 9th Field Ambulance (Stafford).
 388361 Pte. R. Wright, 2nd Field Ambulance (Gateshead).

AMENDMENTS.

The following are the correct descriptions of the undermentioned Non-Commissioned Officer and Man whose names have recently appeared in the *London Gazette* for the award of the Military Medal:—

Military Medal.

London Gazette, dated October 18, 1917: 38027 Pte. E. H. Brownhill (Gazetted as Brounhill, E. J.), 77th Field Ambulance, Royal Army Medical Corps.

The amendment in the *London Gazette* dated May 14, 1919, should read :—

40446 Serjt. (Acting Qmr.-Serjt.) G. W. Benham, Headquarters, 19th Division, Royal Army Medical Corps.

India Office,
July 28, 1919.

The following dispatch from His Excellency the Commander-in-Chief in India on the part taken by India, including the Indian States, in the prosecution of the war, has been received from the Government of India :—

Army Headquarters, India.
Dated Delhi, March 19, 1919.

From the Commander-in-Chief in India.

To the Secretary to the Government of India, Army Department.

SIR,—In continuation of my dispatch dated August 20, 1918, I have the honour to submit the following brief review of the part played by India, including the Native States, in the prosecution of the war.

* * * * *

A list of those whose services have been of particular value and whose assistance and work I desire to bring specially to notice forms the subject of Appendix I of this dispatch.

I have the honour to be, Sir,

Your obedient servant,

(Signed) C. C. MONRO, *General*,
Commander-in-Chief in India.

APPENDIX I.

Major F. A. H. Clarke, Royal Army Medical Corps.

Capt. F. G. Cross, Royal Army Medical Corps.

Major (Temp. Lieut.-Col.) P. Dwyer, M.C., Royal Army Medical Corps.

Major-Gen. P. Hehir, C.B., C.M.G., C.I.E., Indian Medical Service.

Lieut.-Col. K. V. Kukday, Indian Medical Service.

Lieut.-Gen. Sir T. J. O'Donnell, K.C.I.E., C.B., D.S.O., Army Medical Service, Director of Medical Services in India.

Capt. A. G. Tressider, Indian Medical Service.

Major G. S. Wallace, Royal Army Medical Corps.

Lieut.-Col. H. E. Winter, Royal Army Medical Corps.

War Office,
July 21, 1919.

The following are among the decorations and medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign :—

His Majesty the King has given unrestricted permission in all cases to wear the decorations and medals in question.

DECORATIONS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

LEGION D'HONNEUR.

Chevalier.

Temp. Capt. (Acting Major) Lionel Dudley Woods, Royal Army Medical Corps.

Croix de Guerre.

Temp. Capt. Philippe Bernard Belanger, M.C., M.B., Royal Army Medical Corps (Territorial Force).

Major John Macauley Bowie, Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Daniel Cowin, M.B., Royal Army Medical Corps.

Temp. Capt. (Acting Major) Alan Renata Green, Royal Army Medical Corps.

Temp. Capt. Arthur Atkins Greenwood, Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Henry Alphonsus Harbison, M.C., M.B., Royal Army Medical Corps.

Temp. Capt. (Acting Major) Ernest Eugene Herga, M.C., Royal Army Medical Corps.

Major (Temp. Col.) Thomas Kay, D.S.O., M.B., Royal Army Medical Corps (Territorial Force).

Major Burnet Elmer Kelly, 9th Field Ambulance, Canadian Army Medical Corps.
Temp. Capt. Humphrey Neame, Royal Army Medical Corps.

Croix de Guerre.

4894 Serjt. (Acting Qmr.-Serjt.) Walter George Crossman, D.C.M., Royal Army Medical Corps (Tiverton).
48346 Pte. Evan Evans, 131st Field Ambulance, Royal Army Medical Corps (Brymbo).
48055 Pte. Caleb Rogers, 131st Field Ambulance, Royal Army Medical Corps (Aberdare).
48201 Pte. William John Thomas, 131st Field Ambulance, Royal Army Medical Corps (Llandeby).

Palmes Academiques.

Major (Temp. Lieut.-Col.) William Davenport Crawley Kelly, D.S.O., M.B., Royal Army Medical Corps.

Temp. Capt. (Acting Major) Thomas C. Ritchie, O.B.E., M.D., Royal Army Medical Corps.

Temp. Capt. Herbert T. Retallack-Moloney, Royal Army Medical Corps.

LEGION D'HONNEUR.

Chevalier.

Temp. Capt. Maurice Smith Bryce, M.C., M.B., Royal Army Medical Corps.

ORDRE DE L'ETOILE NOIRE.

Officier.

Major (Acting Lieut.-Col.) Thomas Bettsworth Moriarity, D.S.O., Royal Army Medical Corps.

Croix de Guerre.

Capt. Charles Leopold Franklin, M.C., M.B., Royal Army Medical Corps.

Capt. (Acting Major) Norman Veitch Lothian, M.C., M.B., Royal Army Medical Corps.

30179 Serjt.-Major Lionel Hayes, Royal Army Medical Corps (Kew).

Medaille d'Honneur avec Glaires en Argent.

497003 Qmr.-Serjt. (Temp. Serjt.-Major) Harry Gaillard Greeman, Royal Army Medical Corps (Territorial Force) (Kingston-on-Thames).

39447 Qmr.-Serjt. Percy Le Lacheur, Royal Army Medical Corps (Fulham, S.W.).

6231 Serjt. (Temp. Serjt.-Major) Patrick Joseph Martin, Royal Army Medical Corps (Aldershot).

Medaille d'Honneur avec Glaires en Bronze.

56630 Pte. John Barnes, Royal Army Medical Corps (Ealing).

62206 Qmr.-Serjt. William James Bedwell, Royal Army Medical Corps (Preston).

497215 Cpl. (Acting Lance-Serjt.) Edward Charles Dolton, Royal Army Medical Corps (Territorial Force) (East Molesey, Surrey).

495060 Pte. Bert Harry Hatcher, Royal Army Medical Corps (Territorial Force) (Folkestone).

527159 Cpl. William George Stanbrook, Royal Army Medical Corps (Territorial Force) (Southend).

495629 Pte. (Acting Lance-Cpl.) Arthur Cyril Staniland, Royal Army Medical Corps (Territorial Force) (Goole).

388258 Cpl. (Acting Serjt.) William Stephenson, Royal Army Medical Corps (Wallington).

68971 Pte. (Acting Lance-Serjt.) John William Straw, Royal Army Medical Corps (Ilkeston).

388190 Pte. William Thwaites, Royal Army Medical Corps (Territorial Force) (Durham).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE HELLENES.

ORDER OF THE REDEEMER.

Chevalier.

Temp. Capt. James Watson, Royal Army Medical Corps.

Greek Military Cross.

36851 Serjt. Frederick John Filsell, Royal Army Medical Corps (Eastwood).

66116 Pte. Walter John Grant, Royal Army Medical Corps (Crediton).

386358 Lance-Cpl. Thomas Ernest Hall, 1st Northumbrian Field Ambulance, Royal Army Medical Corps (Territorial Force) (Ashington, Northumberland).

41772 Cpl. (Acting Serjt.) Percy Rowell, Royal Army Medical Corps (Stafford).
 71754 Pte. Joseph R. B. Shenton, Royal Army Medical Corps (Liverpool).
 512030 Serjt. George Stewart, 3rd County of London Field Ambulance, Royal Army Medical Corps (Territorial Force) (Parsons Green, S.W.).

DECORATIONS CONFERRED BY THE PRESIDENT OF THE PORTUGUESE REPUBLIC.

MILITARY ORDER OF AVIS.

Grand Officer.

Major-Gen. Howard Carr, C.B., M.D., Army Medical Service.
 Major-Gen. Richard Henry Stewart Sawyer, C.B., C.M.G., M.B., F.R.C.S.I., Retired Pay, late Army Medical Service.

MILITARY ORDER OF AVIS.

Commander

Major (Temp. Lieut.-Col.) George Nixon Biggs, M.B., Royal Army Medical Corps (Territorial Force).
 Lieut.-Col. (Temp. Col.) James Hamilton Campbell, D.S.O., Royal Army Medical Corps.
 Col. Herbert Eustace Cree, Retired Pay, late Army Medical Service.
 Brevet Col. William L'Estrange Eames, C.B., Royal Army Medical Corps.
 Col. John Munro Elder, C.M.G., Canadian Army Medical Corps.
 Lieut.-Col. John Robinson Harper, Royal Army Medical Corps (Territorial Force).
 Col. Edward Moresley Hassard, Army Medical Service.
 Col. Richard Hugh Penton, D.S.O., Army Medical Service.
 Lieut.-Col. Samuel James Chatterton Prittie Perry, F.R.C.S.I., Royal Army Medical Corps.
 Lieut.-Col. (Acting Col.) William Lawrence Steele, C.M.G., Royal Army Medical Corps.
 Col. Hugh Stanley Thurston, C.B., C.M.G.
 Col. Anthony Henry Waring, D.S.O.
 Major Marmaduke Cordeux Wetherell, M.D., Royal Army Medical Corps.

MILITARY ORDER OF AVIS.

Caraleiro.

Temp. Capt. Montgomery du Bois Ferguson, M.B., Royal Army Medical Corps.
 Capt. (Acting Major) Alexander Dickson Stirling, D.S.O., M.B., Royal Army Medical Corps.
 Major John Lawrence Wood, Royal Army Medical Corps.

ARMY MEDICAL SERVICE.

Capt. H. G. Trayer resigns his commission, dated July 30, 1919.
 Temp. Capt. James Kevin Holland to be Lieut., and to be Temp. Capt., from June 1, 1917, but not to reckon for pay or allowances prior to July 1, 1919, with precedence next below T. H. Twigg.
 Capt. James Wynn Hyatt, from Special Reserve, to be Lieut., and to be Temp. Capt., from January 1, 1917, but not to reckon for pay or allowances prior to July 1, 1919, with precedence next below J. P. MacNamara.
 Temp. Lieut. William Hickey, M.C., M.B., relinquishes his commission May 20, 1919, and retains the rank of Lieut. (Substituted for the notification in the *Gazette* of June 26, 1919.)
 Capt. J. C. Sproule relinquishes the acting rank of Lieut.-Col. on re-posting, dated May 17, 1919.
 Lieut.-Col. James C. Jameson, M.B., retires on retired pay, dated July 28, 1919.
 Capt. F. W. M. Cunningham, D.S.O., M.D., retires, receiving a gratuity, dated July 29, 1919.
 Capt. St. J. D. Buxton resigns his commission, dated July 29, 1919.
 Major H. W. Farebrother relinquishes the acting rank of Lieut.-Col. on re-posting, dated May 13, 1919.
 The notification in the *Gazette* of April 11, 1919, regarding Lieut. (Temp. Capt.) G. R. Sharp is cancelled.
 The undermentioned Captains, from Special Reserve, to be Lieutenants, and to be Temporary Captains, but not to reckon for pay or allowances prior to July 1, 1919, with precedence as stated :—
 Dated September 21, 1916.—David Roderick Hennessy, next below G. G. Drummond.
 Dated January 2, 1917.—Thomas Parr, M.B., next below H. Stanton.

Dated May 1, 1918.—John D'Arcy Champney, next below M. C. Paterson.

Col. (Temp. Major-Gen.) Sir Samuel Hickson, K.B.E., C.B., is granted the honorary rank of Major-Gen. on ceasing to be employed, dated May 8, 1919.

Col. Albert L. F. Bate, C.M.G., retires on retired pay, dated July 10, 1919.

Col. W. H. Grattan, C.B., D.S.O., to be Deputy Director of Hygiene at the War Office, dated July 10, 1919.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to July 1, 1919, with precedence as stated.—

Dated February 5, 1918.—Capt. Frank Kershaw Tomlinson, M.B., from Territorial Force, next below R. E. Barnsley.

Dated February 8, 1918.—Capt. Herbert Stuart Griffith, from Special Reserve, next below J. H. Ward.

Dated February 28, 1918.—Richard O'Kelly, from Special Reserve, next below E. T. Burke.

Dated October 23, 1918.—Thomas Young, M.B., from Special Reserve, next below R. McKinlay.

Dated November 7, 1918.—Temp. Capt. Charles Leslie Grove Powell, M.C., next below A. E. Richmond.

Dated November 10, 1918.—Temp. Capt. Lionel Augustine Joseph Graham, next below H. E. P. Yorke.

Dated February 2, 1919.—Temp. Capt. William Graeme Denroche McCall, M.C., next below R. A. Mansell.

Dated May 8, 1919.—Temp. Capt. John Milo Ryan, M.B., next below W. D. Newland.

Lieut.-Col. Richard C. Lewis retires on retired pay, dated August 1, 1919.

The undermentioned relinquish the acting rank of Lieutenant-Colonel on re-posting:—

Dated May 16, 1919.—Capt. A. C. Hammond-Searle, M.C., M.B.

Dated July 1, 1919.—Major and Brevet Lieut.-Col. C. R. Sylvester-Bradley.

Dated December 28, 1919, to April 11, 1919.—Major J. W. S. Seccombe to be Acting Lieut.-Col. whilst commanding a medical unit.

Dated August 1, 1919.—Major Arthur E. Smithson, M.B., is placed on retired pay.

Temp. Capt. Andrew Ernest Seth Pringle-Pattison, M.B., to be Captain, February 15, 1918, but not to reckon for pay or allowances prior to July 1, 1919, with precedence next below H. D. F. Brand.

Capt. David Forsyth Panton, from Special Reserve, to be Lieut. and to be Temp. Capt., January 29, 1918, but not to reckon for pay or allowances prior to July 1, 1919, with precedence next below E. P. K. Creagh.

Brevet Col. (Acting Col.) Robert R. H. Moore, M.D., is granted the rank of Colonel on ceasing to be employed, dated July 18, 1919.

Lieut.-Col. Lyttleton F. F. Winslow retires on retired pay, dated August 2, 1919.

The undermentioned Captains to be Majors:—

Dated July 29, 1919.—Arthur W. Howlett, M.B.; George F. Dawson, M.C., M.B.; Harold S. Dickson; Ronald E. Todd, M.B.; Gerald Petit, M.C.; William R. O'Farrell; (Acting Major) John A. Renshaw; (Acting Major) Dalziel B. McGrigor, M.B.; (Acting Lieut.-Col.) Richard G. S. Gregg, M.B.; William A. Spong, M.B.; Henry P. Hart, M.C., M.B.; (Brevet Major) Francis T. Dowling, M.B.; (Acting Major) Richard F. O'T. Dickinson, M.B.; James C. L. Hingston; (Acting Major) Arthur E. B. Jones, M.D.; (Acting Lieut.-Col.) Benjamin A. Odum, O.B.E.; Alexander Hendry, M.B.; (Acting Major) John R. Lloyd; (Acting Major) James F. Grant, M.B.

Dated July 30, 1919.—(Acting Major) Carlisle Kelly, M.C., M.D.

Major G. de la Cour, M.B., to be Acting Lieut.-Col. whilst commanding a medical unit, dated September 20, 1918. (Substituted for the notification regarding this officer in the *Gazette* of November 9, 1918.)

Major-Gen. Sir Menus W. O'Keefe, K.C.M.G., C.B., M.D., retires on retired pay, dated August 3, 1919.

Major-Gen. Sir M. P. C. Holt, K.C.B., K.C.M.G., D.S.O., is appointed Honorary Surgeon to the King, vice Major-Gen. (Temp. Lieut.-Gen.) Sir W. Babbie, V.C., K.C.M.G., C.B., M.B., K.H.S., dated May 7, 1919.

Capt. W. C. Hartgill, M.C., relinquishes the acting rank of Major, dated December 6, 1918.

War Office,
August 8, 1919.

AMENDMENTS.

London Gazette, dated June 3, 1919.—For Temp. Qmr. and Capt. Henry George Miller, 9th Field Ambulance, Royal Army Medical Corps, read Temp. Qmr. and Capt. Henry George Miller, 91st Field Ambulance, Royal Army Medical Corps.

The following is the correct description of a non-commissioned officer who has been awarded the Distinguished Conduct Medal:—

16231 Qmr.-Serjt. H. B. Mason, Royal Army Medical Corps, 2nd South African Field Ambulance. (*London Gazette*, dated May 26, 1917.)

War Office,
August 11, 1919.

The Secretary of State for War has received the following dispatch from Field Marshal Sir Edmund Allenby, G.C.B., G.C.M.G., Commander-in-Chief, Egyptian Expeditionary Force:—

General Headquarters,
Egyptian Expeditionary Force,
June 28, 1919.

SIR,—I have the honour to forward a dispatch describing events in Syria and Palestine, subsequent to the conclusion of the armistice with Turkey on October 31, 1918.

I have taken the opportunity in this dispatch to give a brief general summary of the campaigns in this theatre, and to express my thanks to some of those who have assisted me during my command of the Egyptian Expeditionary Force.

PART III.—APPRECIATION OF SERVICES.

The Medical Services have dealt successfully with the difficulties of evacuation over long distances in a country of undeveloped communications, and have combated with excellent results the chief scourge of Syria and Palestine, malaria. I desire to mention the good work of Major-General A. E. C. Keble and Major-General Sir R. H. Luce, as Directors of Medical Services at various periods.

I have the honour to be, Sir,

Your most obedient servant,
(Sgd.) EDM. ALLENBY,
General, Commanding-in-Chief, Egyptian
Expeditionary Force.

The undermentioned Majors relinquish the acting rank of Lieut.-Col. on re-posting:—

Dated March 13, 1919.—A. C. H. Gray, O.B.E., M.B.

Dated July 22, 1919.—C. R. Millar, D.S.O.

Capt. Roland Harris Graham, M.B., from Special Reserve, to be Captain, dated April 1, 1919, but not to draw pay or allowances prior to July 1, 1919, with precedence next below M. B. King.

The notifications in the *Gazettes* of May 22 and July 5, 1919, regarding Temp. Capt. (Acting Major) H. C. Watson are cancelled.

The notification regarding Temp. Capt. William J. Woodman in the *Gazette* of July 2, 1919, is cancelled.

The undermentioned Temp. Capts. to be Captains, but not to reckon for pay or allowances prior to July 1, 1919:—

Dated November 28, 1918.—Reginald Norman Porritt, with precedence next below L. W. Evans.

Dated May 10, 1919.—Alger Roy Oram, M.C., M.B., with precedence next below L. S. C. Roche.

Lieut.-Col. Edwin W. P. V. Marriott, D.S.O., retires on retired pay, August 10, 1919.

Capt. H. E. A. Boldero resigns his commission August 10, 1919.

Temp. Capt. John McPhail MacKinnon, M.B., to be Lieut., and to be Temp. Capt., January 25, 1919 (but not to reckon for pay or allowances prior to July 1, 1919), with precedence next below J. D. A. Champney.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

Lieutenant-Colonel proceeding to India shortly wishes to exchange with an officer on the home establishment. Apply O'Grady, c/o Holt & Co., 3, Whitehall Place, London.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

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	16	0 10 6	0 5 0				
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	16	0 13 3	0 5 10				
100	4	0 6 0	0 3 1	7 10	3 11	6 7	2 5
	8	0 10 0	0 4 10				
	16	0 18 6	0 7 6				
200	4	0 9 6	0 4 5	10 10	7 6	9 0	4 10
	8	0 15 0	0 6 7				
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CASES FOR BINDING VOLUMES.—Strong and useful cases for binding can be obtained from the publishers at the undermentioned rates:—

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G. STREET & CO., LTD., 8, SEBLE STREET, LONDON, W.C.

The back outside cover is not available for advertisements.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 56, Cornwall House, Stamford Street, S.E.1.

Communications have been received from the following: Majors T. W. Gordon Kelly and V. T. Carruthers.

The following publications have been received:—

British: Guy's Hospital Gazette, The Medical Press, Public Health, The Medical Journal of South Africa, The Journal of State Medicine, The Hospital, Transactions of the Society of Tropical Medicine and Hygiene, Bulletin of the Liverpool School of Tropical Medicine, Edinburgh Medical Journal, Proceedings of the Royal Society of Medicine, Journal of the Department of Public Health, Hospitals and Charitable Aid, Journal of the Royal Army Service Corps, Journal of the Royal United Service Institution, Journal of Tropical Medicine and Hygiene.

Foreign: Colonies et Marine, Bulletin de l'Institut Pasteur, Bulletin de la Société de Pathologie Exotique, Giornale di Medicina Militare, Surgery, Gynecology and Obstetrics, L'Ospedale Maggiore, Archives Medicales Belges, Bulletin of the Johns Hopkins Hospital, The Military Surgeon, Journal of Infectious Diseases, Office International d'Hygiène Publique.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," Cornwall House, Stamford Street, S.E. 1, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co.," and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,

"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"

CORNWALL HOUSE, STAMFORD STREET, S.E.1.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

OCTOBER, 1919.

EXTRACTS FROM THE "LONDON GAZETTE."

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Honourable Order of the Bath, for valuable services rendered in connexion with military operations in France and Flanders. Dated June 3, 1919:—

To be Additional Member of the Military Division of the Second Class, or Knight Commander, of the said Most Honourable Order:—

Temp. Major-Gen. Sir Anthony Alfred Bowlby, K.C.M.G., K.C.V.O., C.B., F.R.C.S.

To be Additional Member of the Military Division of the Third Class, or Companion, of the said Most Honourable Order:—

Temp. Col. William Taylor, M.B., F.R.C.S.I.,

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give directions for the following promotions in, and appointments to, the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with military operations in France and Flanders. Dated June 3, 1919:—

To be Additional Members of the Second Class, or Knights Commanders, of the said Most Distinguished Order:—

Temp. Col. William Tindall Lister, C.M.G., M.B., F.R.C.S.

Temp. Major-Gen. Cuthbert Sydney Wallace, C.B., C.M.G.

Major-Gen. Henry Neville Thompson, C.B., C.M.G., D.S.O., M.B.

Temp. Major-Gen. Sir Wilmot Parker Herringham, C.B., M.D.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following appointments to the Most Excellent Order of the British Empire for valuable services rendered in connexion with military operations in France and Flanders, dated June 3, 1919:—

To be Knights Commanders of the Military Division of the said Most Excellent Order:—

Major (Temp. Col.) Hamilton Ashley Ballance, C.B., M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Col. Robert Hammill Firth, C.B., F.R.C.S., Army Medical Service.

War Office,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the undermentioned rewards for distinguished service in connexion with military operations in France and Flanders. Dated June 3, 1919 :—

To be Lieutenant-General :—

Major-Gen. (Temp. Lieut.-Gen.) C. H. Burtchaell, K.C.B., C.M.G., M.B., K.H.S.

To be Major-General :—

Col. (Temp. Major-Gen.) S. G. Moores, O.B., C.M.G., late Royal Army Medical Corps.

To be Honorary Major-General on retirement :—

Col. (Temp. Major-Gen.) Sir J. M. Irwin, K.C.M.G., C.B., retired pay, late Royal Army Medical Corps.

To be Brevet Colonels :—

(On Retired List, Reserve of Officers, Special Reserve, New Army or Territorial Force, in the case of officers belonging to the categories, as applicable.)

Lieut.-Col. (Acting Col.) W. R. Blackwell, C.M.G., Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) C. R. Evans, D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) H. B. Fawcus, C.M.G., D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) J. S. Gallie, C.M.G., D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) W. R. P. Goodwin, D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) J. A. Hartigan, C.M.G., D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) L. Humphry, C.M.G., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) T. C. Mackenzie, D.S.O., Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) E. McLennan, D.S.O., M.B., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) J. Powell, D.S.O., M.B., Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) W. Riach, C.M.G., M.D., Royal Army Medical Corps.

Lieut.-Col. (Temp. Col.) A. H. Safford, Royal Army Medical Corps.

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,
June 7, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotion in, and appointment to, the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with military operations in Egypt. Dated June 3, 1919 :—

To be Additional Member of the Second Class or Knight Commander, of the said Most Distinguished Order :—

Col. (Temp. Major-Gen.) Richard Harman Luce, C.B., C.M.G., M.B., F.R.C.S., Territorial Force Reserves, Army Medical Service.

War Office,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the undermentioned reward for distinguished services in connexion with military operations in Egypt. Dated June 3, 1919 :—

To be Brevet Colonel :—

(On Retired List, Reserve of Officers, Special Reserve, New Army or Territorial Force, in the case of officers belonging to these categories as applicable.)

Lieut.-Col. (Temp. Col.) W. H. Ogilvie, C.M.G., M.B., Indian Medical Service.

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give directions for the following promotions in, and appointments to, the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with military operations in Italy. Dated July 3, 1919 :—

To be Additional Member of the Second Class, or Knight Commander, of the said Most Distinguished Order :—

Major-Gen. Foster Reuss Newland, C.B., C.M.G., M.B.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following appointment to the Most Excellent Order of the British Empire for valuable services rendered in connexion with military operations in Italy. Dated June 3, 1919 :—

To be a Knight Commander of the Military Division of the said Most Excellent Order :—
Temp. Col. Charles Gordon Watson, C.M.G., F.R.C.S., Army Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.,

June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in the Most Honourable Order of the Bath, for valuable services rendered in connexion with Military Operations in the Balkans. Dated June 3, 1919:—

To be Additional Member of the Military Division of the Second Class, or Knight Commander, of the said Most Honourable Order:—

Major-Gen. Maurice Percy Cue Holt, K.C.M.G., C.B., D.S.O.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.,

June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Honourable Order of the Bath, for services rendered in connexion with the war. Dated June 3, 1919:—

To be Additional Member of the Military Division of the Second Class, or Knight Commander, of the said Most Honourable Order:—

Major-Gen. (Temp. Lieut.-Gen.) Sir William Babbie, V.C., K.C.M.G., C.B., M.B., K.H.S.

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,

June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give directions for the following promotions in, and appointments to, the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with the war. Dated June 3, 1919.

To be Additional Members of the Second Class, or Knights Commanders, of the said Most Distinguished Order:—

AUSTRALIAN FORCES.

Major-Gen. Sir Neville Reginald Howse, V.C., K.C.B.

Col. Henry Carr Maudsley, C.M.G., C.B.E.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.,

June 3, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire for valuable services rendered in connexion with the war. Dated June 3, 1919:—

To be Knights Commanders of the Military Division of the said Most Excellent Order:—

Col. (Temp. Major-Gen.) George Bradshaw Stanistreet, C.B., C.M.G., M.B., Army Medical Service.

Lieut.-Col. (Temp. Col.) Henry Davy, C.B., M.D., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. and Brevet-Col. German Sims Woodhead, C.B.E., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. Sir Shirley Forster Murphy, Kt., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. D'Arcy Power, M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Major (Temp. Lieut.-Col.) Henry McIllree Williamson Gray, C.B., C.M.G., M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Major (Temp. Lieut.-Col.) Sir Arthur William Mayo-Robson, Kt., C.B., C.V.O., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Major (Temp. Col.) Charters James Symonds, C.B., M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Major and Brevet Lieut.-Col. Frederick Walker Mott, M.D., F.R.C.P., F.R.S., Royal Army Medical Corps (Territorial Force).

Major (Temp. Major-Gen.) Sir Robert Jones, Kt., C.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Capt. (Temp. Lieut.-Col.) Archibald Douglas Reid, C.M.G., Royal Army Medical Corps (Territorial Force).

To be Commanders of the Military Division of the said Most Excellent Order:—

Lieut.-Col. (Temp. Col.) Harry Gilbert Barling, C.B., F.R.C.S., Royal Army Medical Corps.

Major (Temp. Col.) James Swain, C.B., M.D., F.R.C.S., Royal Army Medical Corps.

AUSTRALIAN IMPERIAL FORCES.

To be Knight Commander of the Military Division of the said Most Excellent Order :—

Col. (Hon. Surg.-Gen.) Charles Snodgrass Ryan, C.B., C.M.B., Australian Army Medical Corps.

War Office,
June 9, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the undermentioned rewards for valuable services rendered in connexion with the war. Dated June 3, 1919 :—

To be Brevet Colonels :—

(On Retired List Reserve of Officers, Special Reserve, New Army or Territorial Force, in the case of Officers belonging to these categories as applicable.)

Temp. Lieut.-Col. J. W. Alexander, D.S.O., M.D., Royal Army Medical Corps and Territorial Force Reserve.

Lieut.-Col. (Acting Col.) J. C. Connor, C.M.G., M.B., Royal Army Medical Corps.

Lieut.-Col. T. H. Corkery (retired pay), late Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) C. T. Green, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. W. Howorth, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. H. Littlewood, C.M.G., F.R.C.S., Royal Army Medical Corps (Territorial Force).

CORPS ORDERS.

July 1, 1919.

MEMBERS OF THE MILITARY DIVISION OF THE MOST EXCELLENT ORDER OF THE
BRITISH EMPIRE.

The King has been graciously pleased, on the occasion of His Majesty's birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire for valuable services rendered in connexion with Military Operations in France :—

To be Members of the Military Division of the said Most Excellent Order. (Supplement to the *London Gazette*, dated June 3, 1919).

18718 Qmr.-Serjt. (Temp. Serjt.-Major) W. H. Parr, 11405 Qmr.-Serjt. W. Scott, 58669 Qmr.-Serjt. E. A. Smith, 103 Qmr.-Serjt. (Temp. Serjt.-Major) G. P. Steer.

DISTINGUISHED CONDUCT MEDAL.

His Majesty the King has been graciously pleased to approve of the award of the Distinguished Conduct Medal to the undermentioned Non-commissioned Officers and Men, for gallantry and distinguished service in the Field. The acts of gallantry for which the decoration has been awarded will be announced in the *London Gazette* as early as practicable :—
(Supplement to the *London Gazette*, dated April 17, 1919).

26318 Pte. H. E. Moorcock, M.M., 10904 Pte. (Acting Serjt.) C. Parker, M.M., 45684 Serjt. (Acting Staff-Serjt.) H. J. Wheeler, M.M.

His Majesty the King has been graciously pleased to approve of the award of the Distinguished Conduct Medal to the undermentioned Non-commissioned Officers and Men for distinguished service in connexion with Military Operations with the Armies in France and Flanders :—

(Supplement to the *London Gazette*, dated June 3, 1919).

411 Pte. (Acting Serjt.) C. G. Bowden, 36924 Pte. J. Carless, 63278 Pte. T. Hadfield, 1611 Serjt. P. Hodson, 89718 Serjt. G. Matthews, 58238 Cpl. (Acting Serjt.) F. Mellor, 18423 Temp. Serjt.-Major F. A. Philbrook, 48456 Cpl. E. Schoon, 48812 Pte. W. J. Thomas, 61586 Pte. J. Toner, 83138 Pte. T. Yule.

His Majesty the King has been graciously pleased to approve of the award of the Distinguished Conduct Medal to the undermentioned Non-commissioned Officer for gallantry and distinguished service in the Field. The act of gallantry for which the decoration has been awarded will be announced in the *London Gazette* as early as practicable :—
(Supplement to the *London Gazette*, dated February 18, 1919).

47384 Serjt. W. McBrien, M.M.

His Majesty the King has been graciously pleased to approve of the award of the Distinguished Conduct Medal for distinguished service in connexion with Military Operations with the Armies in Italy :—

(Supplement to the *London Gazette*, dated June 3, 1919).

43296 Pte. W. Tomalin.

MILITARY MEDAL.

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for bravery in the Field to the undermentioned Warrant Officers, Non-commissioned Officers and Men :—

(Supplement to the *London Gazette*, dated March 29, 1919).

67948 Serjt. E. E. Hunt, 34496 Serjt. H. C. Trueman, 18219 Cpl. (Acting Serjt.) D. J. Robertson, 24009 Cpl. L. M. Steer, 75623 Pte. B. Akitt, 2222 Pte. (Acting Cpl.) W. H. Baker,

38530 Pte. W. Bowden, 20654 Pte. J. Cassell, 37609 Pte. F. Crosland, 77032 Pte. W. Fairclough, 117366 Pte. J. Finch, 32267 Pte. J. Meeson, 36073 Pte. E. J. Neale, 39834 Pte. S. C. Park, 43716 Pte. G. E. Ross, 10715 Pte. W. H. Rouget, 37755 Pte. W. H. Thompson, 8103 Pte. T. S. Turley.

(Supplement to the *London Gazette*, dated May 14, 1919).

34939 Serjt. G. Bailey, 89717 Serjt. A. Ellis, 37150 Serjt. A. Laing, 40829 Serjt. (Acting Staff-Serjt.) J. R. Mackenzie, 27431 Serjt. H. S. Miller, 35104 Cpl. J. Baker, 19098 Cpl. (Acting Serjt.) F. P. Burley, 5691 Cpl. (Acting Serjt.) G. Gallagher, D.C.M., 48586 Cpl. T. J. Jones, 17277 Cpl. (Acting Serjt.) R. N. Knowles, 5611 Serjt. A. E. Swatton, 28663 Cpl. (Acting Lance-Serjt.) W. Williams, 100632 Pte. G. S. Abbs, 32704 Pte. F. B. Anderson, 8916 Pte. C. W. Archer, 24046 Pte. M. Armstrong, 72057 Pte. A. W. Ashton, 72737 Pte. W. J. Bannister, 63888 Pte. (Acting Lance-Cpl.) W. Bailey, 7693 Pte. C. E. Berry, 32527 Pte. R. G. Beyer, 57201 Pte. S. J. Bowen, 69303 Pte. A. H. Bridge, 42829 Pte. T. H. W. Burleigh, 1722 Pte. A. H. Coles, 74099 Pte. L. Coles, 66601 Pte. H. Cooke, 62844 Pte. D. S. Cordukes, 6471 Pte. (Acting Cpl.) R. S. Corner, 66923 Pte. (Acting Cpl.) W. T. Dank, 49450 Pte. J. Gauld, 100653 Pte. R. Gibson, 52266 Pte. G. Good, 51846 Pte. F. J. Goodwin, 43601 Pte. P. Grady, 45231 Pte. A. Greenwood, 40359 Pte. G. M. Gregson, 62773 Pte. (Acting Lance-Cpl.) W. W. Haley, 8598 Pte. A. H. Harris, 31143 Pte. H. G. Hayne, 57403 Pte. W. Holden, 74126 Pte. F. A. Hooper, 104934 Pte. O. Hudson, 88395 Pte. J. Hutton, 41364 Pte. T. Hutton, 49096 Pte. E. Jones, 55661 Pte. (Acting Cpl.) T. Jones, 88391 Pte. J. Johnston, 27298 Pte. (Acting Serjt.) A. H. Kelby, 49895 Pte. H. Lager, 101794 Pte. B. Leach, 27272 Pte. T. L. Leblanc, 66674 Pte. E. J. Lewis, 10373 Pte. J. Lock, 65397 Pte. E. A. Mead, 88586 Pte. R. Miller, 31884 Pte. J. Morris, 63822 Pte. F. J. Nightingale, 31779 Pte. H. Page, 1409 Pte. (Acting Cpl.) B. McN. Palmer, 81651 Pte. J. Reynolds, 2095 Pte. P. J. Rudd, 74811 Pte. F. Scorey, 53908 Pte. E. Shallcross, 92180 Pte. S. W. P. Simmonds, 88110 Pte. J. Smith, 75438 Pte. J. Smith, 10214 Pte. J. Sommerville, 37990 Pte. G. Stiles, 25765 Pte. J. J. Sutch, 6369 Pte. E. Tappolet, 66309 Pte. W. J. Terry, 798 Pte. W. Thomas, 46864 Pte. H. W. Turnbull, 33488 Pte. (Acting Lance-Cpl.) T. H. Twigg, 31342 Pte. R. Tyrrell, 3164 Pte. F. Waterfield, 8440 Pte. R. Whyman, 66510 Pte. W. Wills, 73694 Pte. S. G. Wilson, 105155 Pte. J. H. Wright.

(Supplement to the *London Gazette*, dated June 17, 1919).

9484 Serjt. W. Butler, 48086 Serjt. E. H. Evans, 73519 Serjt. J. J. Fishwick, 63912 Serjt. (Acting Staff-Serjt.) D. Jeffreys, 72274 Serjt. F. G. Unwin, 39167 Serjt. E. G. Wilding, 2037 Cpl. (Tem. Serjt.) B. Goulding, 65597 Cpl. J. P. Harrison, 31388 Cpl. T. A. Luck, 21925 Serjt. J. Roe, 27089 Cpl. (Acting Serjt.) C. H. Smith, 28891 Cpl. (Acting Serjt.) G. Walley, 64653 Pte. F. Aked, 89021 Pte. G. H. Arthur, 63713 Pte. M. Atherton, 68768 Pte. J. Atkinson, 53861 Pte. H. Bailie, 858 Pte. A. L. Baker, 72602 Pte. J. Bodsworth, 106231 Pte. G. W. Brawn, 22889 Pte. H. Brooks, 47044 Pte. A. Burgess, 40944 Pte. (Acting Lance-Cpl.) R. Caven, 78007 Pte. C. K. Child, 48098 Pte. W. E. Coleman, 80763 Pte. W. H. Coombs, 47108 Pte. J. Cooper, 39030 Pte. J. Davis, 81510 Pte. J. Drummond, 56102 Pte. A. Duncan, 8183 Pte. H. Earnshaw, 103653 Pte. E. Ellis, 41533 Pte. W. Ellis, 3371 Pte. A. Farrow, 48768 Pte. (Acting Lance-Cpl.) F. L. Findlow, 57591 Pte. W. Flanagan, 72248 Pte. W. J. Gallagher, 19441 Pte. (Temp. Serjt.) H. Gates, 68801 Pte. W. Gilford, 46787 Pte. (Acting Cpl.) W. V. Gordon, 64135 Pte. F. Graydon, 43122 Pte. (Acting Lance-Cpl.) A. G. Green, 30242 Pte. I. Guppy, 63543 Pte. W. Hall, 72411 Pte. A. W. Hargood, 20474 Pte. J. Harvey, 63690 Pte. B. S. Hines, 75995 Pte. C. Holmes, 5513 Pte. J. W. Hoodless, 66505 Pte. F. W. House, 57033 Pte. H. E. Hughes, 74755 Pte. J. Hunt, 72502 Pte. E. A. Ingram, 3529 Pte. J. Jamieson, 7075 Pte. H. Jenkins, 41265 Pte. A. Kennedy, 50502 Pte. J. D. Knowles, 63698 Pte. A. Lingard, 50588 Pte. J. McFarlane, 39373 Pte. J. M. McInnes, 75031 Pte. D. McLeod, 41568 Pte. A. Moores, 775 Pte. M. Murphy, 65674 Pte. N. Poole, 1068 Pte. (Acting Cpl.) J. W. Price, 7754 Pte. (Temp. Serjt.) A. W. Reast, 48179 Pte. J. Richards, 20623 Pte. (Acting Lance-Cpl.) T. L. Rimmington, 38287 Pte. T. Rogerson, 53403 Pte. D. Scoular, 106175 Pte. H. Settle, 81337 Pte. J. Sharman, 77024 Pte. C. A. Sharp, 71952 Pte. G. E. Shea, 38419 Pte. F. W. Sherrin, 42824 Pte. A. R. Sim, 3447 Pte. J. Skelsey, 7496 Pte. A. F. Skinner, 37265 Pte. D. Smart, 17810 Pte. (Acting Lance-Serjt.) F. J. Suitters, 72426 Pte. (Acting Cpl.) W. J. Taylor, 4975 Pte. J. Towland, 1821 Pte. E. Turney, 101364 Pte. T. Walker, 43570 Pte. T. Walters, 2864 Pte. A. Waugh, 43782 Pte. W. D. Way, 12513 Pte. (Acting Cpl.) A. H. West, 27040 Pte. W. Williams, 53733 Pte. H. Wilson, 82290 Pte. G. F. Windybank, 75941 Pte. A. R. Wood.

BAR TO THE MILITARY MEDAL.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Non-commissioned Officers and Men:—

(Supplement to the *London Gazette*, dated March 29, 1919).

8307 Pte. J. Lee, M.M. (Military Medal gazetted November 11, 1916.)
1998 Pte. E. Patrick, D.C.M., M.M. (Military Medal gazetted December 9, 1916.)
8671 Cpl. (Acting Serjt.) T. Mooney, M.M. (Military Medal gazetted December 12, 1917.)

(Supplement to the *London Gazette*, dated May 14, 1919).

36118 Pte. (Acting Lance-Cpl.) A. Holdridge, M.M. (Military Medal gazetted July 9, 1917.)
49892 Cpl. (Acting Serjt.) W. Kirwin, M.M. (Military Medal gazetted August 16, 1917.)

68107 Serjt. J. H. Barton, M.M. (Military Medal gazetted November 2, 1917.)
 25966 Pte. A. Charlton, M.M. (Military Medal gazetted December 17, 1917.)
 54771 Serjt. J. Anderson, M.M. (Military Medal gazetted February 4, 1918.)
 90053 Serjt. (Acting Staff-Serjt.) F. J. Stevens, M.M. (Military Medal gazetted February 4, 1918.)
 55403 Private J. D. Anderson, M.M. (Military Medal gazetted October 7, 1918.)
 33488 Pte. (Acting Lance-Cpl.) T. H. Twigg, M.M. (Military Medal gazetted May 14, 1919.)
 30821 Pte. J. Startin, M.M. (Military Medal gazetted August 28, 1918.)

(Supplement to the *London Gazette*, dated June 17, 1918.)

66717 Pte. B. F. Marsh, M.M. (Military Medal, gazetted December 9, 1916.)
 45476 Pte. J. Paterson, M.M. (Military Medal gazetted January 6, 1917.)
 1415 Pte. (Acting Lance-Serjt.) W. R. Prior, M.M. (Military Medal gazetted April 17, 1917.)
 40234 Pte. A. L. Thomson, M.M. (Military Medal gazetted July 18, 1917.)
 45404 Pte. (Acting Lance-Cpl.) W. J. Gibson, M.M. (Military Medal gazetted August 16, 1917.)
 51766 Pte. J. Wood, M.M. (Military Medal gazetted December 17, 1917.)
 714 Pte. (Temp. Serjt.) W. Parry, M.M. (Military Medal gazetted February 23, 1918.)
 54658 Pte. J. Savage, M.M. (Military Medal gazetted March 13, 1918.)
 56221 Pte. W. H. Fisher, M.M. (Military Medal gazetted February 11, 1919.)

MERITORIOUS SERVICE MEDAL.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-commissioned Officers and Men in recognition of valuable service rendered with the Armies in France and Flanders:—

Supplement to the *London Gazette*, dated June 3, 1919.

12377 Temp. Serjt.-Major B. L. Aldhous, D.C.M., 12989 Temp. Serjt.-Major E. G. W. Barnes, 15544 Temp. Serjt.-Major E. J. Barnes, 40921 Serjt.-Major E. Briggs, 46419 Serjt.-Major H. Charlesworth, 12410 Serjt.-Major R. B. Coombes, 30403 Serjt.-Major A. Crossley, 17358 Temp. Serjt.-Major C. Ennor, 11223 Serjt.-Major J. F. Hampton, 51020 Temp. Serjt.-Major F. Hopkins, 16440 Temp. Serjt.-Major R. Kildea, 58003 Serjt.-Major A. E. Kitchen, M.M., 39116 Temp. Serjt.-Major E. Mitchell, 11613 Serjt.-Major G. R. Morris, M.M., 15619 Serjt.-Major E. Preston, 98302 Temp. Serjt.-Major J. Purves, 25588 Serjt.-Major W. R. Steadman, 12185 Temp. Serjt.-Major A. S. Willis, M.M., 12056 Serjt.-Major E. Winton, 11315 Qmr.-Serjt. G. A. Austin, 15027 Qmr.-Serjt. (Acting Serjt.-Major) W. Bush, 49026 Qmr.-Serjt. C. C. Cooper, 41161 Qmr.-Serjt. W. J. Dennison, 35220 Qmr.-Serjt. H. C. Dixon, 79559 Qmr.-Serjt. W. J. Ellis, 36455 Qmr.-Serjt. W. A. Griffiths, 88151 Qmr.-Serjt. W. J. Hodgkinson, 17632 Qmr.-Serjt. (Temp. Serjt.-Major) H. C. A. Lunn, 66154 Qmr.-Serjt. F. H. L. Poad, 66164 Serjt. A. B. Hibberd, 22999 Staff-Serjt. H. Taylor, 64039 Staff-Serjt. J. Thomson, 69597 Staff-Serjt. W. P. Wood, 15835 Serjt. (Temp. Qmr.-Serjt.) W. Beavis, 749 Cpl. (Temp. Qmr.-Serjt.) J. Evans, 70607 Cpl. J. H. Graham, 66982 Cpl. (Acting Serjt.) H. Holden, 55381 Cpl. J. Kenefick, 38078 Cpl. A. Kirkham, 599 Cpl. (Temp. Serjt.) F. G. Knight, 72337 Cpl. A. H. Loasby, 24610 Cpl. R. Marshall, 4948 Cpl. (Temp. Serjt.) F. H. Marshall, 43698 Cpl. J. Pearce, 58161 Cpl. T. Scanlan, 5098 Cpl. (Acting Serjt.) T. W. Smith, 78438 Cpl. (Acting Serjt.) H. E. Strachan, 58655 Cpl. (Acting Serjt.) F. Turner, 51751 Cpl. (Acting Serjt.) J. R. Walker, 8935 Cpl. (Temp. Staff-Serjt.) D. R. Webb, 81307 Pte. C. W. Allen, 66407 Pte. E. Ashton, 68320 Pte. (Acting Lance-Serjt.) A. E. Baker, 51466 Serjt. J. Hodgkinson, 31811 Serjt. O. Hopkins, 67398 Serjt. J. Jauncey, 41034 Serjt. G. Kerr, 31084 Serjt. C. Lusty, 5328 Serjt. (Temp. Qmr.-Serjt.) F. Maydon, 19283 Serjt. E. Meagher, 71496 Serjt. J. Moncur, 66744 Serjt. H. G. Parker, 65873 Serjt. G. Pellett, 18411 Serjt. G. H. Richards, 37246 Serjt. N. Riddle, 18799 Serjt. (Temp. Qmr.-Serjt.) V. Smith (M.M.), 40858 Serjt. H. J. Standerwick, 4405 Serjt. (Acting Staff-Serjt.) E. F. Taylor, 189 Serjt. G. A. Taylor, 79059 Serjt. H. W. Townley, 57020 Serjt. J. A. V. Wakefield, 26007 Staff-Serjt. (Acting Qmr.-Serjt.) J. W. Waller, 42637 Serjt. A. Wedgbury, 296 Serjt. F. G. Wilson, 19730 Serjt. (Acting Qmr.-Serjt.) W. T. Young, 45811 Cpl. R. Ashley, 24215 Cpl. (Acting Qmr.-Serjt.) A. Auty, 18003 Cpl. (Temp. Staff-Serjt.) F. Batcock, 13654 Cpl. (Temp. Serjt.) F. Clapton, 19271 Cpl. (Acting Serjt.) A. W. Dale, 67264 Cpl. (Acting Serjt.) H. Ellison, 74683 Qmr.-Serjt. H. W. Prince, 19135 Serjt. (Temp. Qmr.-Serjt.) W. H. Quelch, 41872 Qmr.-Serjt. E. H. P. Rawlins, 41996 Qmr.-Serjt. F. W. Tomkinson, 39488 Qmr.-Serjt. S. Unsworth, 52160 Qmr.-Serjt. A. S. Ward, 54417 Qmr.-Serjt. J. White, 19827 Staff-Serjt. (Temp. Qmr.-Serjt.) J. W. Baxter (M.M.), 18380 Staff-Serjt. (Temp. Qmr.-Serjt.) E. Bodger, 17870 Staff-Serjt. (Temp. Serjt.-Major) E. Cragg, 87317 Staff-Serjt. A. Currell, 19007 Staff-Serjt. (Acting Serjt.-Major) J. R. Dare, 40540 Staff-Serjt. W. C. Dickson, 41162 Staff-Serjt. (Acting Serjt.-Major) A. Donnelly (M.M.), 12434 Staff-Serjt. (Acting Serjt.-Major) R. B. Eallett, 35059 Staff-Serjt. D. Grandy, 38145 Staff-Serjt. E. Goddard, 53534 Staff-Serjt. J. Graham, 2046 Staff-Serjt. (Temp. Qmr.-Serjt.) F. J. Hammond, 40037 Staff-Serjt. P. Heyes, 17728 Staff-Serjt. T. Hynes, 1302 Staff-Serjt. (Temp. Qmr.-Serjt.) J. Jack, 37480 Staff-Serjt. B. J. Jones, 19272 Staff-Serjt. W. J. Lee, 50192 Staff-Serjt. N. Linnet, 61214 Staff-Serjt. (Acting Serjt.-Major) W. J. MoNamara, 16932 Staff-Serjt. (Temp. Serjt.-Major) J. Medland, 53553 Staff-Serjt. A. S. Mustart, 74016 Pte. (Acting Lance-Cpl.) G. H. W. Browning, 674 Pte. (Temp. Cpl.) P. W. Clarke, 74618 Pte. (Acting Serjt.) J. F. Cox, 11736 Pte. (Temp. Serjt.) H. Davidson, 54320 Pte. H. Dixon, 90487 Pte. (Acting Cpl.)

S. A. Dyer, 68407 Pte. (Acting Serjt.) A. H. Foard, 18770 Cpl. (Acting Lance-Serjt.) J. A. Fosh, 73606 Pte. (Acting Cpl.) T. M. Grant, 51283 Pte. (Acting Lance-Cpl.) G. R. Harkess, 38150 Pte. (Acting Lance-Cpl.) T. Harrington, 64458 Pte. (Acting Lance-Cpl.) J. Hills, 5363 Pte. (Acting Cpl.) A. Hunter, 26004 Cpl. (Acting Lance-Serjt.) H. E. Kincaid, 7319 Pte. (Temp. Serjt.) L. Marcus, 117713 Pte. (Acting Serjt.) A. E. Meadows, 8955 Pte. (Acting Serjt.) C. A. Michie, 4530 Pte. D. Middleton, 38895 Pte. (Acting Cpl.) T. Morgan, 33522 Serjt. (Acting Staff-Serjt.) W. A. Blezard, 17519 Serjt. (Temp. Staff-Serjt.) A. Boxall, 19597 Serjt. (Temp. Qmr.-Serjt.) L. Brindle, 65120 Serjt. A. O. A. Broocke, 81627 Serjt. J. Bruce, 12384 Serjt. T. W. Burnhill, 43356 Serjt. H. B. Chatburn, 72639 Serjt. H. A. Christian, 59245 Serjt. J. J. Clarke, 19851 Serjt. (Temp. Staff-Serjt.) P. E. Claydon, 39999 Serjt. C. E. Collinge, 16303 Serjeant (Temp. Qmr.-Serjt.) H. Cunningham, 32070 Serjt. (Acting Staff-Serjt.) A. C. Dow, 73999 Serjt. F. P. Harrison, 40584 Serjt. J. Harrison, 37166 Pte. (Acting Cpl.) J. L. Parry, 34109 Pte. L. Priestly, 71820 Pte. (Acting Cpl.) F. Prior, 16763 Pte. (Acting Cpl.) S. Roberts, 7460 Pte. Temp. Serjt. R. M. Robinson, 80849 Pte. (Acting Serjt.) G. H. Salter, 42299 Pte. (Acting Cpl.) F. Short, 64204 Pte. (Acting Cpl.) J. S. Smith, 8803 Pte. Acting (Lance-Serjt.) S. R. B. Smith, 26798 Qmr.-Serjt. W. O. Parker, 19161 Staff-Serjt. G. Parkinson, 47238 Staff-Serjt. C. Perks, 45468 Staff-Serjt. A. Preston, 18559 Staff-Serjt. G. F. Rogers, 30737 Staff-Serjt. (Acting Serjt.-Major) G. H. Saunders, 106900 Pte. C. H. Wain, 54083 Pte. (Acting Cpl.) E. Walker, 91281 Pte. (Acting Cpl.) G. Walton, 13628 Pte. (Acting Serjt.) W. R. Wathen.

His Majesty the King has been graciously pleased to approve of award of the Meritorious Service Medal to the undermentioned Warrant Officers, Non-commissioned Officers and Men, in recognition of valuable services rendered in connexion with the War.

(Supplement to the *London Gazette*, dated June 3, 1919.)

28658 Temp. Serjt.-Major E. J. Downes, 17736 Temp. Serjt.-Major J. D. Keeble, 15955 Temp. Serjt.-Major H. G. Miller, 5081 Temp. Serjt.-Major F. S. Parton, 32157 Serjt.-Major H. J. Stacey, 12582 Serjt.-Major J. Whiting, 27357 Qmr.-Serjt. R. H. Crosse, 16289 Qmr.-Serjt. (Acting Serjt.-Major) C. G. Hearn, 26109 Qmr.-Serjt. T. Leo, 33408 Qmr.-Serjt. (Acting Serjt.-Major) F. W. Murch, 26882 Qmr.-Serjt. C. Pitkin, 26117 Qmr.-Serjt. E. H. Stevens, 9711 Staff-Serjt. W. Brocklesby, 1868 Staff-Serjt. (Acting Serjt.-Major) E. B. Browne, 25471 Staff-Serjt. J. C. Chesterton, 184 Staff-Serjt. (Acting Qmr.-Serjt.) I. B. Dodd, 9618 Staff-Serjt. J. Hall, 19980 Staff-Serjt. H. J. Loder, 67781 Staff-Serjt. (Acting Qmr.-Serjt.) C. H. J. Locke, 105317 Staff-Serjt. A. Wheeldon, 9718 Serjt. W. J. Abbot, 8699 Serjt. (Acting Staff-Serjt.) W. G. Chettleburgh, 59245 Serjt. (Acting Serjt.-Major) J. Johnston, 29013 Serjt. (Acting Qmr.-Serjt.) S. G. Rhodes, 40112 Serjt. (Acting Serjt.-Major) A. Hope, 19997 Staff-Serjt. (Acting Serjt.-Major) R. J. Tilby, 67932 Serjeant H. B. Trehane, 8812 Serjeant (Acting Staff-Serjt.) W. R. Watson, 55547 Cpl. (Acting Serjt.) J. A. Frazer, 61688 Pte. (Acting Qmr.-Serjt.) J. M. Aitken, 104318 Pte. (Acting Serjt.) A. W. J. Denny, 911 Pte. S. Jones, 104441 Pte. (Acting Qmr.-Serjt.) W. Kershaw, 101510 Pte. (Acting Qmr.-Serjt.) C. Lambert, 16353 Pte. (Acting Cpl.) J. H. Pilling, 16809 Pte. (Acting Serjt.) A. E. H. Riding, 16242 Pte. A. Porter.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Man in recognition of valuable service rendered with the British Force in North Russia (Archangel Command):—

(Supplement to the *London Gazette*, dated June 3, 1919.)

55041 Pte. J. Turner.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Non-commissioned Officer in recognition of valuable service rendered with the British Forces in North Russia (Murmansk Command):—

(Supplement to the *London Gazette*, dated June 3, 1919.)

38197 Pte. (Acting Serjt.) J. Pickston.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-commissioned Officers and Men, in recognition of valuable services rendered with the Forces in Egypt:—

(Supplement to the *London Gazette*, dated June 3, 1919.)

32251 Serjt.-Major G. F. Lyon, 14326 Temp. Serjt.-Major W. P. S. Morman, 90994 Serjt.-Major E. C. Woodhouse, 25570 Qmr.-Serjt. W. King, 31101 Qmr.-Serjt. J. G. Palmer, 12651 Staff-Serjt. (Acting Serjt.-Major) R. H. Bennett, 36402 Staff-Serjt. (Acting Serjt.-Major) C. Gooding, 50873 Cpl. (Acting Staff-Serjt.) C. W. Anderson, 103244 Serjt. W. W. Ball, 1985 Cpl. (Acting Staff-Serjt.) R. H. Brown, 120891 Pte. (Acting Serjt.) A. L. Babbage, 96505 Pte. S. E. Bachrach, 85495 Pte. J. Bolton, 44285 Serjt. F. E. Leach, 50203 Staff-Serjt. M. T. Morgan, 17553 Temp. Serjt.-Major J. R. Morfitt, 17699 Staff-Serjt. (Temp. Serjt.-Major) C. Morrall, 56199 Staff-Serjt. J. Simpson, 1825 Staff-Serjt. A. G. Williams, 79273 Serjt. (Acting Staff-Serjt.) F. J. Ellis, 2210 Serjt. (Acting Staff-Serjt.) W. Fletcher, 29531 Serjt. F. E. Leach, 51671 Serjt. H. J. Rowlands, 92384 Cpl. (Acting Serjt.) J. R. Allen, 125397 Pte. (Acting Serjt.) E. Cartmell, 61567 Pte. J. N. Colley, 121275 Pte. (Acting Serjt.) A. V. Day, 94851 Pte. J. J. Dowse, 145525

Pte. W. Everitt, 145524 Pte. J. Rayment, 125315 Pte. (Acting Serjt.) J. Unsworth, 86951 Pte. D. Williamson, 104515 Pte. (Acting Serjt.) J. R. Woodcock.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Warrant Officers, Non-commissioned Officers and men in recognition of valuable services rendered with the British Forces in the Balkans :—

(Supplement to the *London Gazette*, dated June 3, 1919.)

11812 Temp. Serjt.-Major W. C. Banks, 46222 Serjt.-Major S. D. Saville, 28706 Staff-Serjt. J. G. Collier, 26956 Serjt. E. James, 45140 Serjt. T. C. Jones, 30557 Serjt. B. Lewin, 11424 Serjt. (Acting Staff-Serjt.) E. Weavis, 21061 Cpl. E. F. Fincham, 47128 Cpl. (Acting Serjt.) A. J. Asplin, 78240 Cpl. (Acting Qmr.-Serjt. A. L. Clarkson, 16506 Cpl. C. Lark, 25230 Cpl. [T. A. Wexted, 8609 Pte. H. Godding, 46943 Pte. (Acting Cpl.) F. W. Pentland.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Warrant Officers, and Non-commissioned Officers in recognition of valuable services rendered in connexion with military operations with the Forces in East Africa :—

(Supplement to the *London Gazette*, dated June 3, 1919.)

21837 Serjt. H. Hammond, 19031 Serjt. J. Leahy, 18610 Corpl. (Acting Serjt.-Major) H. W. Hassard.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to approve of the award of the Meritorious Service Medal to the undermentioned Warrant Officers and Noncommissioned Officers, in recognition of valuable services rendered with the British Forces in Italy :—

(Supplement to the *London Gazette*, dated June 3, 1919.)

17260 Serjt.-Major G. W. Payne, 18973 Staff-Serjt. (Temp. Qmr.-Serjt.) J. J. Abbott, 2083 Staff-Serjt. (Acting Serjt.-Major) W. G. Pearce, 18737 Staff-Serjt. (Acting Serjt.-Major) W. T. Stovold, 1970 Staff-Serjt. (Acting Serjt.-Major) W. J. G. Brunt, 34131 Serjt. (Acting Staff-Serjt.) A. O. Judd, 83038 Pte. (Acting Corpl.) J. W. Hindley.

HONOURS AND REWARDS.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the 'campaign :—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

(Supplement to the *London Gazette*, dated April 1, 1919.)

Ordre de Leopold II.

Chevalier.

18432 Qmr.-Serjt. (Temp. Serjt.-Major) G. F. Pearce.

Décoration Militaire, Second Class.

70609 Pte. E. Bell, 79983 Pte. W. Birnie, 82002 Pte. W. T. Green, 49058 Pte. R. T. Hamilton. 31153 Serjt. R. Lake, 92309 Pte. (Acting Cpl.) A. McArthur, 53946 Pte. J. A. Mooney.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

(Supplement to the *London Gazette*, dated April 5, 1919.)

Décoration Militaire.

3657 Pte. A. Graham (M.M.), 41307 Pte. R. S. Greenfield (M.M.), 53722 Pte. G. L. McCausland (M.M.).

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

(Supplement to the *London Gazette*, dated May 1, 1917.)

Croix de Guerre.

3532 Pte. J. W. Stephenson is now correctly described.

(Supplement to the *London Gazette*, dated April 5, 1919.)

DECORATIONS AND MEDALS CONFERRED BY HIS MAJESTY THE KING OF ITALY.

(Supplement to the *London Gazette*, dated May 17, 1919.)

Bronze Medal for Valour.

20654 Pte. J. Cassell, 43296 Pte. W. Tomalin, 8310 Cpl. J. Webster (D.C.M.), 1998 Pte. E. Patrick (D.C.M.) (M.M.).

DECORATIONS AND MEDALS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.
(Supplement to the *London Gazette*, dated June 7, 1919.)

Medaille Militaire.

26867 Serjt. F. Charles.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.
(Supplement to the *London Gazette*, dated June 7, 1919.)

Silver Medal for Zealous Service.

105438 Pte. (Acting Cpl.) S. H. D. George.

Cross of Mercy.

23208 Pte. (Acting Serjt.) J. N. Greaves, 60069 Pte. G. Smith.

DECORATIONS AND MEDALS PRESENTED BY THE PRESIDENT OF THE FRENCH REPUBLIC.
(Supplement to the *London Gazette*, dated June 19, 1919.)

Croix de Guerre.

41261 Serjt. A. S. Bell, 22437 Pte. S. H. Cox, 81270 Pte. (Acting Lance-Cpl.) C. Franks, 35272 Pte. W. Gray, 69063 Serjt. J. H. Jones, 66936 Pte. P. Llewellyn, 65765 Pte. (Acting Lance-Serjt.) J. Peat, 38368 Serjt.-Major E. Ratcliffe, (D.C.M.), 66919 Cpl. (Acting Serjt.) E. A. Suelling, 30147 Qmr.-Serjt. (Acting Serjt.-Major) C. Sumners, 31089 Pte. J. R. West, 31816 Serjt. (Acting Qmr.-Serjt.) B. Wilson.

MENTIONED IN DISPATCHES.

The following Warrant Officers, Non-commissioned Officers and Men were mentioned in the Dispatch from General Sir E. H. H. Allenby, G.C.B., G.C.M.G., Commander-in-Chief, Egyptian Expeditionary Force:—

(Supplement to the *London Gazette*, dated June 5, 1919.)

84038 Pte. A. V. Allen, 36641 Serjt. A. A. Aston, 104986 Pte. (Acting Cpl.) G. Barnes, 58674 Cpl. (Acting Serjt.) H. B. Bell, 45015 Cpl. F. A. Bingle, 25443 Staff-Serjt. C. L. London, 118942 Pte. P. T. Matthews, 17825 Staff Serjt. N. Moore, 32264 Pte. (Acting Cpl.) E. R. Moss, 18251 Staff-Serjt. E. E. Ovendon, 112232 Pte. (Acting Cpl.) A. Bond, 26859 Pte. W. F. Brickwood, 25273 Staff-Serjt. J. Collins, 67891 Serjt. W. A. Coutts, 12730 Pte. (Temp. Cpl.) A. C. Croft, 84030 Pte. E. Cross, 69097 R. C. Serjt. Davis, 21224 Pte. W. J. Dixie, 60541 Pte. (Acting Lance-Cpl.) T. B. Donaldson, 83991 Pte. (Acting Cpl.) W. Douglas, 137777 Pte. (Acting Serjt.) J. P. Dunbar, 35683 Pte. J. E. Edwards, 10510 Serjt.-Major W. T. Eldergill, 25875 Pte. G. E. Finn, 83511 Serjt. H. Firth, 123201 Pte. (Acting Serjt.) B. Foggitt 53449 Cpl. (Acting Staff-Serjt.) L. Freeborough, 18634 Qmr.-Serjt. F. H. Galton, 81022 Pte. G. Geddes, 79205 Pte. T. R. Goddard, 11764 Pte. A. V. Gooch, 67737 Qmr.-Serjt. R. Grant, 87489 Pte. G. T. Haines, 59802 Staff-Serjt. A. Hilton, 53131 Qmr.-Serjt. G. C. Hitchcock, 5911 Serjt. (Temp. Staff-Serjt.) H. J. Howard, 127377 Pte. G. T. Inglis, 94555 Pte. S. J. Ireland, 99704 Pte. W. Jones, 103358 Pte. (Acting Lance-Cpl.) F. Lister, 63002 Pte. (Acting Serjt.) J. R. Owen, 22244 Cpl. E. Pearson, 6060 Cpl. (Temp. Staff-Serjt.) R. W. Pegg, 1785 Serjt. W. J. Phillips, 78982 (Acting Cpl.) Pte. R. Rice, 28629 Serjt. F. Rigby, 27726 Cpl. H. Rimmer, 26666 Staff-Serjt. T. M. Sayers, 93403 Serjt. J. Sharpe, 83932 Pte. A. C. Simmons, 25663 Cpl. E. Steele, 34463 (Acting Lance-Cpl.) Pte. R. Stephens, 40229 Pte. A. Stewart, 21126 Cpl. J. McK. Symonds, 83110 Pte. E. N. Taylor, 56343 Staff-Serjt. C. Thompson, 22289 Cpl. F. I. Tuck, 75439 Pte. E. Wallas, 11761 Serjt.-Major F. S. Walls, 24845 Pte. (Acting Serjt.) E. H. Warren, 123684 Pte. A. W. Wells, 51767 Cpl. (Acting Serjt.) F. West, 38489 Cpl. A. H. Wilson, 119744 Cpl. J. Wilson, 100206 Pte. (Acting Lance-Cpl.) T. Wilson, 66780 Pte. S. Wiltshire, 58865 Cpl. (Acting Serjt.) W. H. Winslet, 76970 Serjt. (Acting Staff-Serjt.) J. H. Worthington.

The following Non-commissioned Officers and Men were mentioned in the Dispatch from Lieut.-General Sir J. L. Van Deventer, K.C.B., C.M.G., Commanding-in-Chief, East African Force:—

(Supplement to the *London Gazette* dated June 5, 1919.)

2034 Cpl. H. F. Beck, 57575 Serjt. R. Buxton, 9828 Staff-Serjt. C. G. Clarke, 43913 Serjt. J. Collier, 60253 Serjt. A. Dawber, 79120 Serjt. D. G. Evans, 97378 Pte. A. C. Farrier, 68975 Serjt. E. A. Forbes, 83574 Serjt. I. N. Irving, 6273 Cpl. H. A. H. Parnell, 10285 Pte. A. E. Rolston, 98412 Cpl. T. G. Seaward, 6114 Pte. W. L. Till, 63452 Pte. T. Williamson, 79475 Serjt. S. A. Wright, 120089 Staff-Serjt. F. G. Waring.

The following Warrant Officers, Non-Commissioned Officers and Men were mentioned in the Dispatch from Lieut.-General Sir G. F. Milne, K.C.B., K.C.M.G., D.S.O., Commanding-in-Chief, British Solomon Islands Force:—

(Supplement to the *London Gazette*, dated June 5, 1919.)

2118 Serjt. (Acting Qmr.-Serjt.) J. Ashcroft, 16447 Staff-Serjt. (Acting Qmr.-Serjt.) J. W. Ashworth, 42112 Pte. E. J. Bell, 43420 Serjt. J. Bonsall, 94356 Pte. (Acting Lance-Serjt.) H. Bromhead, 100816 Serjt. H. J. Brooks, 63398 Pte. A. M. Brushy, 22387 Cpl. (Acting Serjt.) J.

Buckley, 33022 Pte. T. Burnett, 89002 Serjt. E. Butterworth, 96667 Pte. F. Cheeseman, 82305 Pte. (Acting Serjt.) G. Churchman, 117042 Pte. J. Jones, 110318 Cpl. (Acting Serjt.) O. E. L. Jones, 78897 Serjt. J. J. Laurence, 26766 Pte. G. B. Lee, 15983 Temp. Serjt.-Major C. E. Lister, 221 Cpl. (Acting Serjt.) J. G. Long, 93783 Pte. J. MacKenzie, 39376 Serjt.-Major A. J. Magee, 89363 Pte. (Acting Cpl.) A. Marr, 22129 Cpl. (Acting Lance-Serjt.) A. S. Marshall, 6231 Serjt. (Temp. Serjt.-Major) P. J. Martin, 53778 Cpl. W. Mayes, 59582 Staff-Serjt. H. A. Constable, 24049 Pte. (Acting Cpl.) A. H. Crowle, 92735 Pte. M. Davies, 81913 Pte. T. I. Davies, 10611 Pte. (Acting Lance-Serjt.) J. Devine, 49823 Staff-Serjt. (Acting Serjt.-Major) R. Dunn, 46621 Pte. P. Fenton, 119464 Pte. W. Ferrill, 9389 Pte. H. G. Field, 8306 Pte. (Acting Serjt.) F. Fowler, 55006 Serjt. F. Foxall, 37222 Serjt. W. Haiselden, 12052 Staff-Serjt. (Temp. Serjt.-Major) F. C. Halkett, 60286 Pte. (Acting Serjt.) J. A. C. Hampden, 47840 Pte. J. Harrison, 30179 Serjt.-Major L. McL. Hayes, 39747 Cpl. (Acting Serjt.) S. Hogg, 11287 Pte. (Acting Lance-Cpl.) T. H. Hollingworth, 69487 Cpl. (Acting Lance-Serjt.) C. Howe, 100609 Pte. A. Hunter, 28769 Pte. (Acting Lance-Cpl.) J. W. Illingworth, 874 Staff-Serjt. (Temp. Serjt.-Major) F. A. Johnson, 59956 Cpl. H. Jones, 79188 Pte. M. McDowell, 60031 Serjt. (Acting Staff-Serjt.) A. Miles, 46435 Cpl. H. S. Morgan, 32630 Pte. S. Moulton, 70913 Pte. J. Murphy, 26078 Cpl. (Acting Serjt.) A. H. Naish, 105352 Pte. F. G. Orchard, 93660 Serjt.-Major W. A. Paul, 57448 Pte. (Acting Cpl.) W. Pizzie, 37886 Serjt. A. Pomfret, 9043 Pte. (Acting Serjt.) J. T. Reese, 104945 Serjt. (Acting Qmr.-Serjt.) T. Rooum, 89157 Pte. G. H. Rowse, 85082 Pte. (Acting Cpl.) J. D. Rushton, 19515 Staff-Serjt. G. D. Salter, 92389 Qmr.-Serjt. (Acting Serjt.-Major) W. J. Smith, 26028 Serjt.-Major W. V. H. Smith, 55851 Pte. F. Standish, 26020 Serjt.-Major A. Stead, 42757 Cpl. W. A. Tither, 53015 Serjt. D. Wallace, 28111 Pte. W. Wightman, 19662 Pte. O. W. Woodward, 24205 Serjt. S. C. Yeomans, 23910 Pte. R. Young.

The undermentioned Warrant Officers, Non-commissioned Officers and Men, were mentioned in the Dispatch from General F. R. Earl of Cavan, K.P., K.C.B., M.V.O., Commander-in-Chief of the British Forces in Italy:—

(Supplement to the *London Gazette*, dated June 5, 1919.)

104110 Pte. E. G. Castle, 15671 Qmr.-Serjt. (Temp. Serjt.-Major) R. W. Cole, 90476 Cpl. (Acting Serjt.) N. Fletcher, 90781 Serjt. J. A. Goodman, 19029 Staff-Serjt. (Acting Serjt.-Major) R. E. Harvey, 24 Staff-Serjt. P. H. Haynes, 58429 Pte. J. Hurdman, 89155 Serjt. (Acting Qmr.-Serjt.) C. H. Lee, 31909 Pte. (Acting Cpl.) W. H. Lewis, 7897 Pte. J. A. Maloney, 40058 Pte. F. Osborne, 59439 Pte. J. Tabernacle, 6587 Cpl. C. Wright.

The following Warrant Officers, Non-commissioned Officers and Men were mentioned in the Dispatch from Lieut.-General Sir W. R. Marshall, K.C.B., K.C.S.I., Commanding-in-Chief, Mesopotamian Expeditionary Force:—

(Supplement to the *London Gazette*, dated June 5, 1919.)

80931 Pte. (Acting Serjt.) R. W. Boniface, 76205 Pte. (Acting Cpl.) E. C. Atkinson, 97905 Pte. (Acting Serjt.) H. M. Bennett, 28173 Serjt. R. T. G. Bradley, 88408 Pte. (Acting Serjt.) A. M. Brine, 27882 Pte. (Acting Lance-Cpl.) W. Browning, 97889 Pte. (Acting Serjt.) P. J. Cleary, 79850 Pte. (Acting Serjt.) E. J. Cooper, 79578 Serjt. J. Cumming, 105643 Pte. W. J. Greenbalgh, 59764 Cpl. (Acting Serjt.-Major) C. Grice, 77964 Pte. (Acting Cpl.) C. H. Marshall, 29533 Staff-Serjt. F. J. H. Martin, 59763 Pte. (Acting Staff-Serjt.) W. Middleton, 12506 Qmr.-Serjt. (Acting Serjt.-Major) P. J. O'Rourke, 83876 Pte. (Acting Serjt.) L. W. Oxley, 25038 Qmr.-Serjt. H. Payne, 28022 Serjt. D. Pugh, 21872 Pte. (Acting Lance-Cpl.) J. L. Read, 83506 Pte. (Acting Serjt.) A. C. Roberts, 249 Serjt. (Acting Staff-Serjt.) A. H. Scovell, 77549 Pte. (Acting Qmr.-Serjt.) C. R. Spraggon, 79315 Pte. (Acting Serjt.) H. R. Halkes, 39428 Serjt. (Acting Staff-Serjt.) A. T. Hawkes, 51901 Pte. (Acting Serjt.) R. H. Heaney, 12748 Pte. C. Homer, 14926 Serjt.-Major W. H. G. Hunt, 102810 Pte. (Acting Lance-Cpl.) C. Isherwood, 32621 Pte. (Acting Serjt.) A. Johuson, 83823 Pte. (Acting Serjt.) S. W. Longthorne, 79025 Pte. F. Stephens, 18170 Staff-Serjt. (Acting Serjt.-Major) L. Sufirin, 97921 Cpl. (Acting Serjt.) G. P. Trasler, 105907 Pte. O. Turner, 78697 Pte. E. Vaughan, 104458 Pte. (Acting Cpl.) W. Walton, 105484 Pte. (Acting Serjt.) J. F. Collinge, 36555 Qmr.-Serjt. (Acting Serjt.-Major) H. J. Stark.

BROUGHT TO NOTICE.

The names of the undermentioned have been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the War, and when applicable an entry will be made in the records of service:—

(War Office communique dated March 25th, 1919.)

113360 Pte. (Acting Cpl.) A. G. Allen, 78123 Pte. (Acting Staff-Serjt.) E. Burrows, 29691 Staff-Serjt. S. A. Clarke, 51825 Pte. W. Fairclough, 8770 Serjt.-Major J. Grossman, 104133 Serjt. J. Hill, 11258 Serjt.-Major G. Leggatt, 15783 Staff-Serjt. (Acting Serjt.-Major) E. F. H. Lloyd, 11788 Serjt.-Major D. Macdonald, 83282 Pte. (Acting-Cpl.) R. W. A. MacDonald, 4962 Qmr.-Serjt. J. Matheson, 4942 Serjt. A. McCombie, 10992 Serjt. W. Murray, 29512 Staff-Serjt. J. Phelps, 15079 Serjt. W. Rowson, 104547 Staff-Serjt. C. R. Sturgiss.

(War Office communique dated March 27th, 1919.)

61688 Pte. (Acting Qmr.-Serjt.) J. M. Aitken, 25387 Qmr.-Serjt. J. F. Barker, 25547 Serjt. G. G. Bees, 10568 Pte. (Acting Serjt.-Major) G. Bennett, 50274 Cpl. (Acting-Serjt.) A. W. C. Bowes,

31203 Pte. W. M. Bristow, 9631 Serjt. (Acting Staff-Serjt.) J. Browning, 104179 Cpl. (Acting-Serjt.) A. R. Burton, 9713 Qmr.-Serjt. J. D. Carlisle, 10400 Temp. Serjt.-Major T. F. Catley, 25471 Staff-Serjt. (Acting Qmr.-Serjt.) J. C. Chesterman, 8699 Serjt. (Acting Staff-Serjt.) W. G. Chettleburgh, 27359 Qmr.-Serjt. R. H. Crosse, 23775 Serjt.-Major G. R. Curry, 25796 Qmr.-Serjt. A. Curtis, 104318 Pte. (Acting Serjt.) A. W. J. Denney, 194 Staff-Serjt. (Acting Qmr.-Serjt.) I. B. Dodd, 79002 Cpl. (Acting Qmr.-Serjt.) G. E. Easley, 67731 Serjt. (Acting Qmr.-Serjt.) A. Fallon, 16524 Qmr.-Serjt. (Temp. Serjt.-Major) H. Fandam, 7948 Serjt. (Acting Serjt.-Major) H. Farmer, 104925 Cpl. (Acting Staff-Serjt.) H. V. Garnham, 99018 Pte. (Acting Serjt.) P. George, 67670 Serjt. (Acting Serjt.-Major) E. J. Gibson, 67768 Serjt. (Acting Staff-Serjt.) H. W. Woffinden, 17727 Staff-Serjt. (Temp. Serjt.-Major) A. Wrigley, 28923 Staff-Serjt. (Acting Serjt.-Major) F. Goodenough, 28979 Cpl. (Acting Staff-Serjt.) R. Gray, 26969 Cpl. W. Greedy, 27396 Staff-Serjt. G. Grocott, 100830 Cpl. (Acting Serjt.) J. Hurley, 27848 Serjt. T. Jackson, 67782 Pte. (Acting-Cpl.) E. C. Jakeman, 104441 Pte. (Acting Qmr.-Serjt.) W. Kershaw, 66765 Pte. (Acting-Serjt.) G. W. Lambourne, 26050 Staff-Serjt. (Acting Qmr.-Serjt.) J. Lisle, 29013 Serjt. (Acting Qmr.-Serjt.) S. G. Rhodes, 28939 Staff-Serjt. A. E. Richards, 56999 Pte. (Acting Cpl.) E. Robinson, 11582 Serjt.-Major J. Ryan, 100723 Pte. (Acting Cpl.) W. H. Sherwood, 28331 Staff-Serjt. A. H. Smithard, 26196 (Staff-Serjt.) F. Stevens, 28834 Temp. Serjt.-Major W. H. Terry, 26354 Serjt. J. W. Thornley, 25952 Serjt.-Major E. E. Wallis, 105317 Staff-Serjt. A. Wheeldon, 28675 Staff-Serjt. H. T. Williams, 18230 Staff-Serjt. (Acting Serjt.-Major) F. Winkley, 106151 Cpl. H. Wise, 12999 Pte. J. Yerrill.

The names of the undermentioned have been brought to the notice of the Secretary of State for War by Major-Gen. C. C. M. Maynard, C.B., C.M.G., D.S.O., Commanding-in-Chief, Allied Land Forces, Murmansk District, for valuable and distinguished services rendered in connexion with the operations at Murmansk :—

(Supplement to the *London Gazette*, dated June 5th, 1919.)

22613 Pte. T. Gardner, 129467 Pte. C. Grocey, 115535 Pte. H. W. Phillips, 51455 Pte. (Acting Serjt.) F. Hines.

The names of the undermentioned have been brought to the notice of the Secretary of State for War by Major-Gen. W. E. Ironside, C.M.G., D.S.O., Commanding-in-Chief, Northern Russia Expeditionary Force, for valuable and distinguished services rendered in connexion with the Operations at Archangel :—

(Supplement to the *London Gazette*, dated June 5th, 1919.)

44337 Qmr.-Serjt. A. S. Clarke, 13921 Staff-Serjt. (Acting Serjt.-Major), J. W. Cooper, 29074 Serjt. J. A. Hanman, 27225 Qmr.-Serjt. (Temp. Serjt.-Major) W. Lee, 4427 Cpl. (Acting Serjt.) A. H. Richards.

PROMOTIONS.

The following promotions will take effect from the dates specified :—

To be Staff-Serjeant.—1360 Serjt. J. Doyle (with seniority next below 5442 Staff-Serjt. A. E. Woodward), dated February 13, 1919.

To be Serjeants.—200152 Cpl. W. J. Flanagan (with seniority next below 119 Serjt. J. M. Murray), dated January 13, 1919; 200044 Cpl. S. Lawson (with seniority next below 2124 Serjt. W. Butt, dated January 22, 1919; 5348 Cpl. H. J. Evans (with seniority next below 5341 Serjt. W. E. Conway. On being re-transferred to the R.A.M.C., on May 19, 1919), dated May 19, 1919; 18833 Cpl. R. Crook (W.O. Letter 18/A.M.C./922 (A.M.D.1) dated July 21, 1919), dated July 22, 1919.

To be Corporals.—1263 Pte. A. W. Bird. (D.C.M.) (In accordance with Corps Order No. 2, dated March 15, 1919, with seniority next below 6037 Cpl. C. Sebry (M.M.), dated February 1, 1919; 411 Pte. L. G. Bowden, (D.C.M.) (In accordance with Corps Order No. 15, dated June 3, 1919), dated June 3, 1919.

These promotions are subject to the conditions laid down in paragraph 35 Standing Orders for the R.A.M.C., 1914.

TEMPORARY PROMOTIONS.

The following temporary promotions, under the provisions of paragraph 4 of A.C.I. 717 of 1917, to complete War Establishment, will take effect from the dates specified :—

To be Temporary Serjeant-Majors.—18890 Qmr.-Serjt. J. Moore (D.C.M.), dated May 6, 1917; 12947 Staff-Serjt. M. Henderson (M.M.), dated May 6, 1917; 19401 Staff-Serjt. A. E. Harland, dated May 6, 1917; 1094 Staff-Serjt. H. B. Alloway, dated May 6, 1917; 17210 Qmr.-Serjt. C. E. James, dated 6 May, 1917; 15027 Qmr.-Serjt. W. Bush, dated 6 May, 1917; 17485 Qmr.-Serjt. H. Kennedy, dated May 6th, 1917; 18576 Qmr.-Serjt. W. Lambkin (D.C.M.), dated August 26, 1917; 18821 Staff-Serjt. G. Weston, dated December 15, 1917; 19558 Staff-Serjt. T. Lythgoe, dated October 6, 1918; 18192 Qmr.-Serjt. M. Harlen (W.O. Letter B.M./X.H./141/19/A.M.D.1. (A.G.4.d.) dated July 8, 1919), dated October 29, 1918.

These temporary promotions are subject to the conditions laid down in paragraph 35 Standing Orders for the R.A.M.C., 1914.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

The undermentioned Non-commissioned Officers have been selected for admission to Q.A.I.M.N.S., with increased pay at sixpence (6d.) a day in accordance with Article 861, Royal Warrant for Pay, from the dates specified :—

5281 Serjt. A. Jerred (M.M.), dated October 3, 1918, vice 19453 Staff-Serjt. A. C. Wingate; 2264 Serjt. W. T. H. Blake, dated February 2, 1919, vice 19814 Staff-Serjt. A. G. Crocker.

BUGLERS.

The undermentioned Boys are appointed Buglers from May 6, 1919, inclusive :—
12737 E. H. Haywood, 12805 F. J. W. Power, 12946 L. G. Macfarlane.

AMENDMENTS—CORPS ORDERS.

(a) The awards of Chevalier of the Order of Leopold II. to the Warrant Officers, Non-commissioned Officers and Men, published in Corps Order, dated March 15, 1919 (Supplement to the *London Gazette*, dated November 29th, 1918), are hereby cancelled. An amended list will be published shortly.

(Supplement to the *London Gazette*, dated December 7, 1918.)

(b) Amendments as under will be made to Corps Order, dated March 15, 1919 :—

DISTINGUISHED CONDUCT MEDAL.

For 55915 Serjt. D. Charleson read 55195 Serjt. D. Charleson; for 18990 Qmr.-Serjt. (Acting Serjt.-Major) T. Moore, read 18890 Qmr.-Serjt. (Acting Serjt.-Major) T. Moore.

(c) Corps Order, dated March 15, 1919. From the list given in (Supplement to the *London Gazette*, dated March 13, 1919) delete the names after 81357 Pte. (Acting Cpl.) H. W. Webster, and insert under the following heading as below :—

"The names of the undermentioned Warrant Officers and Non-commissioned Officers have been brought to the Notice of the Secretary of State for War for valuable services rendered on Hospital Ships during the War :"—

12428 Staff-Serjt. (Acting Serjt.-Major) F. J. Ferguson, 17937 Qmr.-Serjt. (Acting Serjt.-Major) P. A. Kirby, 16474 Staff-Serjt. W. Lowery, 2106 Staff-Serjt. (Acting Serjt.-Major) J. Macdonald, 18018 Qmr.-Serjt. (Acting Serjt.-Major) F. G. Phipps, 16564 Qmr.-Serjt. (Acting Serjt.-Major) C. Vickers, 18243 Serjt. (Acting Serjt.-Major) W. Vincent.

(d) *Temporary Promotions*.—Amendments as under will be made to Corps Order, dated March 15, 1919. The date of promotion to the rank of Temporary Serjeant Major of the following Warrant Officers, and Non-commissioned Officers will be amended to read May 6, 1917 :—

16190 Staff-Serjt J. R. Cowling, 19595 Staff-Serjt. C. E. Bull, 1305 Staff-Serjt. H. M. Prince, 14580 Staff-Serjt. S. R. Gurnsey, 18657 Staff-Serjt. V. Tripp, 19126 Serjt. F. H. Perkins, 754 Staff-Serjt. H. Russell, 17553 Staff-Serjt. J. R. Morfitt, 17094 Staff-Serjt. J. Hunter, 18433 Staff-Serjt. J. A. Shaw, 18383 Staff-Serjt. M. W. Hutchings, 18226 Staff-Serjt. L. V. Bilbee, 12676 Qmr.-Serjt. E. A. Young, 12474 Staff-Serjt. W. Soper, 17244 Staff-Serjt. A. F. McArthur, 17632 Qmr.-Serjt. H. C. A. Lunn, 12775 Staff-Serjt. H. C. Prett.

REPOSTING TO CORPS.

The undermentioned Warrant Officer rejoined the Corps from the date specified :—
16165 Qmr.-Serjt. P. Bullough, May 19, 1919.

PROMOTION CANCELLED.

The promotion to the rank of Corporal of 4543 Pte. J. Coughlin, Royal Army Medical Corps, notified in Corps Order, dated March 3rd, 1919, is hereby cancelled.

War Office,
August 13, 1919.

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for bravery in the Field to the undermentioned Non-commissioned Officer :—

ARCHANGEL COMMAND.

MILITARY MEDAL.

Royal Army Medical Corps.

57940 Cpl. (Acting Serjt.) F. Watkin (Liverpool).

MERITORIOUS SERVICE MEDAL.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Non-commissioned Officer and Men in recognition of valuable service rendered with the British Forces in North Russia (Archangel Command) :—

Royal Army Medical Corps.

318203 Staff-Serjt. (Acting Serjt.-Major) W. B. Findlay (Glasgow).

545255 Pte. (Acting Serjt.) J. I. Gopp (Walthamstow).

153459 Pte. J. A. E. Lofthouse (Middlesbro).

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the following Non-commissioned Officers in recognition of valuable service rendered with the British Force in North Russia (Murmansk Command):—

Royal Army Medical Corps.

26579 Qmr.-Serjt. B. Thomas (Bengeo).

347008 Serjt. (Acting Qmr.-Serjt.) S. G. Day (E.) Ipswich).

War Office,
August 20, 1919.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Non-commissioned Officer:—

BAR TO THE MILITARY MEDAL.

17794 Staff-Serjt. (Acting Serjt.-Major) W. A. Beckett, M.M., 16th Field Ambulance, Royal Army Medical Corps (Hammersmith). (M.M., gazetted October 27, 1916.)

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for bravery in the Field to the undermentioned Warrant Officers, Non commissioned Officers and Men:—

ROYAL ARMY MEDICAL CORPS.

17084 Temp. Serjt.-Major J. Hunter, 5th Field Ambulance (Gosport).

30668 Serjt.-Major F. Richardson, 6th Cavalry Field Ambulance (Barnet).

354020 Temp. Serjt.-Major E. Roberts, 3rd Field Ambulance (Manchester).

18717 Qmr.-Serjt. (Acting Serjt.-Major) C. H. Hart, 11th Casualty Clearing Station (Ilford).

36203 Staff-Serjt. H. Anthony, 97th Field Ambulance (Birmingham).

339012 Staff-Serjt. J. H. Thorp, 98th Field Ambulance (Liverpool).

417022 Serjt. G. A. Cudworth, 1st Field Ambulance (Derby).

46586 Serjt. T. Drury, 35th Field Ambulance (Manchester).

301009 Serjt. T. Gillispie, 89th Field Ambulance (Aberdeen).

390057 Serjt. (Acting Staff-Serjt.) J. R. Glenton, 3rd Field Ambulance (Hull).

320138 Serjt. W. Murray, 3rd Field Ambulance (Edinburgh).

19776 Serjt. G. Swan (Paddington). (Salonica.)

32989 Serjt. H. V. Turton (Sheffield).

528198 Serjt. K. Vernon (New Malden).

510255 Serjt. N. A. Wheeler (Hammersmith). (Salonica.)

441035 Serjt. W. Whittle (Birmingham).

47064 Serjt. H. A. Wright, 42nd Field Ambulance (Bolton).

354131 Cpl. J. Ansell, 3rd Field Ambulance (Salford).

19336 Cpl. (Acting Staff-Serjt.) A. Barnes, 10th Field Ambulance (Catford, S.E.)

25370 Cpl. (Acting Lance-Serjt.) H. J. Cade, 103rd Field Ambulance (Woolwich).

5037 Cpl. (Acting Serjt.) W. J. Sykes, 5th Cavalry Field Ambulance (Huddersfield).

73671 Pte. R. Arnott, 27th Field Ambulance (Glasgow).

31991 Pte. H. G. Briggs, 75th Field Ambulance (Nuneaton).

63393 Pte. H. Calverley (Rohdale). (Salonica.)

46045 Private (Acting Lance-Cpl.) D. Drummond, 91st Field Ambulance (Leven).

43444 Pte. J. T. E. Edmunds, 16th Field Ambulance (Darlington).

69215 Pte. T. Fox, 92nd Field Ambulance (Walsall).

71738 Pte. (Acting Lance-Cpl.) T. Hacking, 137th Field Ambulance (Accrington).

495439 Pte. G. Harvey, 2nd Field Ambulance (Wittersham).

510291 Pte. J. H. Jordan (Stoke Newington). (Salonica.)

106290 Pte. W. S. Kilsby (Wellingborough). (Mesopotamia.)

417333 Pte. H. P. Mosley, 1st Field Ambulance (Derby).

352169 Pte. H. Maddox, 2nd Field Ambulance (Manchester).

68529 Pte. C. Parson, 17th Field Ambulance (Huddersfield).

386270 Pte. F. Perry, 1st Field Ambulance (Newcastle).

419005 Pte. W. Pollard, 2nd Field Ambulance (Leicester).

350096 Pte. (Acting-Cpl.) W. Roberts, 3rd Field Ambulance (Manchester).

354271 Pte. J. R. Robinson, 3rd Field Ambulance (Levenshulme).

93493 Pte. A. G. Roche, 18th Field Ambulance (Norwich).

44735 Pte. D. Sharp, 35th Field Ambulance (Dunblane).

81030 Pte. I. Simcox, 1st Field Ambulance (Dunblane).

74269 Pte. F. W. Tanner, 138th Field Ambulance (Bath).

46164 Pte. F. Thomas, 17th Field Ambulance (Todmorden).

51768 Pte. R. Walker, 18th Field Ambulance (South Shields).

200111 Pte. (Temp. Cpl.) E. A. Williams, 12th Field Ambulance (Bristol).

66540 Pte. F. Wilson, 138th Field Ambulance (Banbury).

AMENDMENTS.

The following are the correct descriptions of the undermentioned Warrant Officers, Non-commissioned Officers and Men, whose names have recently appeared in the *London Gazette* for the award of the Military Medal and Meritorious Service Medal:—

*Military Medal.**London Gazette*, dated May 14, 1919.

34939 Serjt. J. Bailey, 133rd Field Ambulance, Royal Army Medical Corps.

*Meritorious Service Medal.**London Gazette*, dated June 3, 1919.

33059 Staff-Serjt. D. Gandy, Royal Army Medical Corps (gazetted as Grandy).

510201 Temp. Serjt.-Major F. Hopkins, 2nd Field Ambulance, Royal Army Medical Corps.

30854 Serjt. B. Lewis, Royal Army Medical Corps.

343139 Pte. L. Priestley, Royal Army Medical Corps.

30737 Staff-Serjt. (Acting Serjt.-Major) G. H. Sanders, Royal Army Medical Corps (gazetted as Saunders).

War Office,

August 21, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

*Ordre de la Couronne.**Chevalier*: Temp. Capt. John Rawlings Rees, Royal Army Medical Corps.*Décoration Militaire.*

31310 Pte. William Harold Ward, 27th Field Ambulance, Royal Army Medical Corps (Lincoln).

DECORATIONS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

*Légion d'Honneur.**Commandeur*: Major-Gen. Maurice Percy Cue Holt, K.C.B., K.C.M.G., D.S.O.*Chevalier*: Major George William Webb Ware, D.S.O., M.B., Royal Army Medical Corps.*Croix de Guerre avec Etoile (en Argent).*

Capt. Robert Burgess, D.S.O., M.C., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Trevor Abbott Lawder, M.B., 24th Field Ambulance, Royal Army Medical Corps.

Capt. Peter Joseph Ryan, M.C., M.B., 24th Field Ambulance, Royal Army Medical Corps.

Croix de Guerre.

Temp. Capt. Frank Percival Montgomery, M.C., M.B., Royal Army Medical Corps.

Capt. Joseph Amidie Arnond Pare, M.C., 11th Canadian Field Ambulance, Canadian Army Medical Corps.

Temp. Capt. (Acting Major) Frederick Butwell Winfield, Royal Army Medical Corps.

Médaille d'Honneur avec Glaives (en Vermeil).

Major William Davenport Crawley Kelly, D.S.O., M.B., Royal Army Medical Corps.

Temp. Capt. Herbert T. Retallack-Moloney, Royal Army Medical Corps.

Major Thomas Clark Ritchie, M.D., Royal Army Medical Corps.

Médaille des Epidémies (d'Or).

Lieut.-Col. Arthur Russell Aldridge, C.B., C.S.I., C.M.G., M.B., Royal Army Medical Corps (Reserve of Officers).

Major-Gen. Sir Hayward Reader Whitehead, K.C.B., F.R.C.S.

Médaille des Epidémies (en Argent).

Temp. Capt. George Dunluce Eccles, M.C., Royal Army Medical Corps (Territorial Force).

Temp. Capt. David Llewelyn Williams, M.C., Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE HELLENES.

*Order of the Redeemer.**Officer*: Col. Edwin Thomas Fairweather Birrell, C.B., C.M.G., M.B., Army Medical Service (late Royal Army Medical Corps).*Military Cross.**Second Class*: Temp. Capt. William Keverall McIntyre, M.C., M.B., Royal Army Medical Corps.*Third Class*: Temp. Capt. George Philip Buckingham Huddy, Royal Army Medical Corps; Capt. Bernard Elwell Potter, M.B., Royal Army Medical Corps (Territorial Force).*Medal for Military Merit.**Third Class*: Col. Edwin Thomas Fairweather Birrell, C.B., C.M.G., M.B., Army Medical Service (late Royal Army Medical Corps).

DECORATIONS AND MEDALS CONFERRED BY HIS MAJESTY THE KING OF ITALY.

Silver Medal for Military Valour.

90441 Pte. George Thomas Lane, Royal Army Medical Corps (Hanley).

Croce di Guerra.

Capt. (Acting Major) Myer Coplans, D.S.O., O.B.E., M.D., Royal Army Medical Corps (Territorial Force).

DECORATIONS CONFERRED BY THE PRESIDENT OF THE PORTUGUESE REPUBLIC.

Military Order of Avis.

Grand Officer: Major-Gen. Sir William Watson Pike, K.C.M.G., D.S.O., F.R.C.S.I., Major-Gen. Henry Neville Thompson, K.C.M.G., C.B., D.S.O., M.B.

Commander: Major and Brevet Lieut.-Col. Percival Davidson, C.M.G., D.S.O., M.B., Royal Army Medical Corps.

Temp. Major (Acting Lieut.-Col.) Thomas Barton Unwin, O.B.E., M.B., Royal Army Medical Corps.

Chevalier: Capt. (Acting Lieut.-Col.) George Singleton Parkinson, D.S.O., Royal Army Medical Corps.

DECORATIONS AND MEDALS CONFERRED BY H.M. THE KING OF SERBIA.

Order of St. Sava.

3rd Class: Major Joseph Ward, C.M.G., D.S.O., Royal Army Medical Corps (Territorial Force).

4th Class: Temp. Capt. Richard Arden Wilson, Royal Army Medical Corps.

CORRECTIONS.

The following are now correctly described:—

London Gazette.—No. 31150, dated January 29, 1919.

Médaille Militaire.

Page 1449—2412 Pte. Alfred Edward Cooper, Royal Army Medical Corps, attached 3rd Brigade, Royal Garrison Artillery.

London Gazette, No. 31409, dated June 19, 1919.

Croix de Guerre.

Page 7809—55272 Pte. William Armstrong Gray, 105th Field Ambulance, Royal Army Medical Corps.

Page 7812—53393 Serjt. Thomas Paterson, Royal Army Medical Corps.

Page 7812—34858 Staff Serjt. Joseph David Porter, Royal Army Medical Corps.

COMMUNIQUE.

N.B.—This list is for publication in the Press only, and will not be gazetted.

War Office,

August 23, 1919.

The names of the undermentioned have been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the war, and, when applicable, an entry will be made in the records of service of officers and other ranks.

Department of the Under-Secretary of State for War.

Col. L. K. Harrison, 5th Northern General Hospital, Royal Army Medical Corps (Territorial Force).

Major J. Lytle, Shropshire Volunteers, Royal Army Medical Corps.

Col. U. Matthews, London Volunteers, Royal Army Medical Corps.

Lieut.-Col. J. G. Yolland, Kent Volunteers, Royal Army Medical Corps.

779553 Serjt. T. E. Brinsley, Hampshire Volunteers, Royal Army Medical Corps.

Department of the Chief of the Imperial General Staff.

Capt. J. P. Kinloch, Royal Army Medical Corps (Territorial Force).

*Department of the Adjutant-General to the Forces.**Royal Army Medical Corps.*

Temp. Capt. W. G. E. Allen.

Capt. E. B. Allnut, M.C.

Major G. N. Anderson, M.B. (T.F.).

Temp. Major A. S. G. Bell.

Capt. H. F. Bellamy.

Temp. Capt. I. M. Byers, M.B.

Temp. Capt. (Acting Major) W. A. Clayton.

Major E. L. D. Dewdney (T.F.).

Major J. H. Dixon, M.D. (T.F.).

Temp. Capt. H. B. Emerson.

Temp. Capt. P. R. Eskell.

Major J. Fairbairn, M.B.

Temp. Capt. J. H. Glover, M.B.

Temp. Capt. S. W. Green.

Temp. Capt. W. R. G. Hamilton, F.R.C.S.I.

Capt. L. C. Hayes, M.B.

Temp. Capt. J. G. Heath.

Temp. Capt. T. Heywood, M.D.

Temp. Capt. W. P. Jones.
 Temp. Capt. F. Jubb.
 Temp. Qmr. and Capt. E. Kirk.
 Temp. Capt. H. A. Lane.
 Temp. Major L. E. Lanyon-Owen.
 Temp. Capt. J. C. Lavertine, F.R.C.S.I.
 Temp. Capt. J. M. Lazenby, M.B.
 Temp. Capt. G. W. P. Maitland, M.B.
 Temp. Capt. (Acting Major) H. McIntyre.
 Temp. Major R. T. Meadows.
 Temp. Capt. (Acting Major) H. H. O'Heffernan.
 Capt. A. B. Pettigrew (T.F.).
 Temp. Capt. J. A. Quin, M.B.
 Temp. Major P. J. A. Seccombe, M.B.
 Temp. Capt. R. E. Smith.
 Qmr. and Capt. W. Spencer (Temp. Major, Special List).
 Temp. Capt. H. G. Steel.
 Temp. Major T. Walcott, M.D.
 Temp. Capt. L. H. Walsh, M.D.
 Temp. Major A. W. Wilcox, M.D.
 541205 Serjt. (Acting Staff-Serjt.) T. W. Addison.
 5613 Cpl. (Acting Qmr.-Serjt.) H. Bates.
 516016 Serjt. C. Chapman.
 29691 Qmr.-Serjt. S. A. Clarke.
 517013 Serjt.-Major J. D. C. Daly.
 388503 Serjt. C. F. M. Dibben.
 103104 Serjt. E. T. R. Edwards.
 1836 Serjt. W. J. Edwards.

102929 Serjt. S. C. Evans.
 18447 Staff-Serjt. (Acting Serjt.-Major J. E. Fakes.
 354389 Staff-Serjt. H. Fritton.
 29565 Serjt. O. Hall.
 78505 Cpl. J. Heagerty.
 40112 Serjt. (Acting Serjt.-Major) A. W. Hope.
 29373 Serjt. W. H. Hurford.
 13725 Serjt. G. Mackintosh.
 4962 Qmr.-Serjt. J. Matheson.
 97332 Serjt. W. J. A. McDonald.
 63 Cpl. (Acting Staff-Serjt.) H. Owen.
 23118 Serjt. W. Oxborough.
 5081 Serjt.-Major F. S. Parton.
 103110 Serjt. A. Pickering.
 83318 Serjt. D. R. Reese.
 4427 Serjt. A. H. Richards.
 12053 Serjt.-Major W. Ross.
 97242 Serjt. C. W. Sleight.
 77636 Serjt. J. A. Smith.
 117935 Serjt. A. O. Spare.
 5239 Serjt. S. R. Stow.
 104517 Qmr.-Serjt. C. R. F. Sturgis.
 48467 Serjt. E. T. Thomas.
 6179 Cpl. (Acting Staff-Serjt.) M. Whelan.
 18196 Serjt. J. White.
 6608 Cpl. S. G. Wilce.
 57040 Serjt.-Major P. C. Williams.
 83672 Pte. H. Wilson.
 19938 Serjt. (Acting Staff-Serjt.) A. Wright.

Department of the Quartermaster-General to the Forces.

Royal Army Medical Corps.

Qmr. and Lieut. A. Sinfeld (T.F.).
 Temp. Lieut. (Acting Capt.) J. L. Wright.
 Capt. S. C. Wyatt.

18801 Serjt.-Major G. H. Wolfe, attached
 R.A.O.C.

War Office,
 September 4, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

Croix de Guerre

Temp. Capt. (Acting Major) Winslow Seymour Sterling Berry, O.B.E., M.C., Royal Army Medical Corps.

Capt. (Acting Lieut.-Col.) Joseph Mary Aloysius Costello, M.C., M.B., Royal Army Medical Corps (Territorial Force).

Temp. Capt. (Acting Major) Walter Seymour Danks, M.B., 97th Field Ambulance, Royal Army Medical Corps.

Capt. Lionel Alfred Dingley, M.D., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. (Temp. Col.) Otto William Alexander Elsner, C.B.E., D.S.O., Royal Army Medical Corps.

Temp. Capt. (Acting Major) Thomas Ferguson, M.B., 42nd Field Ambulance, Royal Army Medical Corps.

Capt. (Acting Major) John Douglas Fiddes, M.C., M.D., F.R.C.S., 89th Field Ambulance, Royal Army Medical Corps (Territorial Force).

Lieut.-Col. George John Houghton, D.S.O., Royal Army Medical Corps.

Major and Brevet Lieut.-Col. (Temp. Lieut.-Col.) Frederick Duke Gwynne Howell, D.S.O., M.C., Royal Army Medical Corps.

Capt. Ivor Robert Hudleston, D.S.O., 136th Field Ambulance, Royal Army Medical Corps.

Temp. Capt. (Acting Major) James Jack, M.C., M.B., 28th Field Ambulance, Royal Army Medical Corps.

Capt. and Brevet Major (Acting Lieut.-Col.) Frederick Robert Laing, M.B., Royal Army Medical Corps.

Temp. Capt. George Edwin Lindsay, M.C., M.B., Royal Army Medical Corps, attached 2nd Battalion Royal Irish Rifles.

Temp. Capt. Charles William Berry Littlejohn, M.B., 140th Field Ambulance, Royal Army Medical Corps.
 Lieut.-Col. (Temp. Col.) Langford Newman Lloyd, C.M.G., D.S.O., Royal Army Medical Corps.
 Temp. Capt. John Black Mason, Royal Army Medical Corps.
 Qmr. and Temp. Lieut. William Edward Perritt, 109th Field Ambulance, Royal Army Medical Corps.
 Temp. Capt. John Charles Robb, M.B., 108th Field Ambulance, Royal Army Medical Corps.
 Lieut. (Acting Major) Laurence Sebastian Cecil Roche, M.C., 138th Field Ambulance, Royal Army Medical Corps.
 Capt. (Acting Lieut.-Col.) John Rowe, M.C., 103rd Field Ambulance, Royal Army Medical Corps.
 Capt. (Acting Major) Harold Arthur Bowell, M.C., Royal Army Medical Corps.
 Capt. Harold Seddon, M.B., Royal Army Medical Corps (Territorial Force), attached 87th Field Ambulance, Royal Army Medical Corps.
 Qmr. and Capt. Charles Francis Tyson, 105th Field Ambulance, Royal Army Medical Corps.
 Temp. Captain (Acting Major) Henry Currie Watson, M.C., M.B., 102nd Field Ambulance, Royal Army Medical Corps.
 55403 Pte. James Douglas Anderson, M.M., 88th Field Ambulance, Royal Army Medical Corps (South Shields).
 66658 Cpl. George Annand, 140th Field Ambulance, Royal Army Medical Corps (Reading).
 68768 Pte. Atkinson, 95th Field Ambulance, Royal Army Medical Corps (Burnley).
 32028 Serjt. William Joseph Bayliss, M.M., 27th Field Ambulance, Royal Army Medical Corps (Dartford).
 63938 Cpl. (Acting Serjt.) Guy Spence Bradley, Royal Army Medical Corps (West Hampstead).
 54629 Staff-Serjt. Fred Bothwell Burrow, 110th Field Ambulance, Royal Army Medical Corps (Bolton).
 63786 Cpl. (Acting Serjt.) Lawrence Calverley, 138th Field Ambulance, Royal Army Medical Corps (Garforth, near Leeds).
 528064 Cpl. (Acting Serjt.) Harry Clark, 119th Sanitary Section, Royal Army Medical Corps (Territorial Force) (Leeds).
 32070 Staff-Serjt. Alfred Charles Dow, 28th Field Ambulance, Royal Army Medical Corps (Lee).
 350207 Serjt. Arthur Hammerton, 2/1st (East Lancashire) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Manchester).
 27568 Cpl. Wilfred Holmes, D.C.M., M.M., 89th (High.) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Warsop, Notts).
 45610 Serjt. James Bernard Hyde, M.M., 104th Field Ambulance, Royal Army Medical Corps (Toddington).
 493663 Cpl. Alfred Thomas Charles Jarvis, 1st (H.C.) Field Ambulance, Royal Army Medical Corps (Gravesend).
 19547 Staff-Serjt. Walter Albert Mansell, 108th Field Ambulance, Royal Army Medical Corps (E. London).
 301115 Cpl. (Acting Serjt.) George Cruickshank Nicol, M.M., 89th (High.) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Aberdeen).
 12266 Temp. Serjt.-Major Herbert Parker, 93rd Field Ambulance, Royal Army Medical Corps (E., St. Helens, Jersey).
 62588 Qmr.-Serjt. Charles Harry Parkes, 136th Field Ambulance, Royal Army Medical Corps (Bradford).
 337223 Pte. Thomas Salisbury, M.M., 87th (West Lancashire) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Liverpool).
 68319 Serjt. Frederick Charles Smith, 107th Field Ambulance, Royal Army Medical Corps (Staplehurst).
 52506 Pte. John Sterling, 109th Field Ambulance, Royal Army Medical Corps (Lisburn).
 5611 Serjt. Ernest Arthur Swatton, M.M., 89th Field Ambulance, Royal Army Medical Corps (Bulford).
 60684 Serjt. Frederick Webber, 94th Field Ambulance, Royal Army Medical Corps (Stourbridge).
 49804 Staff-Serjt. Thomas Wilson, 109th Field Ambulance, Royal Army Medical Corps (Carrickfergus).
 46875 Serjt.-Major George Charles Yeatman, 97th Field Ambulance, Royal Army Medical Corps (South Kensington).

COMMUNIQUE.

N.B.—This list is for publication in the Press only, and will not be gazetted.

War Office,

September 9, 1919.

The names of the undermentioned are to be added to those brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the war, which were published in the Press Communiqué dated March 27, 1919.

105297 Pte. (Acting Cpl.) S. F. Attwell, Royal Army Medical Corps.

21293 Staff-Serjt. J. H. Mason, Royal Army Medical Corps.

111663 Pte. (Acting Lance-Cpl.) A. P. Shaw, Royal Army Medical Corps.

DELETION.

The undermentioned is deleted : Press Communiqué dated March 27, 1919 :—
 Capt. H. W. Spaight, Royal Army Medical Corps (Territorial Force).

War Office,
 September 12, 1919.

The King has been graciously pleased to approve of the undermentioned rewards, for distinguished services rendered in connexion with Military Operations on the North-West Frontier, India, in Persia and Trans-Caspia. Dated June 3, 1919 :—

To be Brevet Majors :—

Capt. J. A. A. Kernahan, Indian Medical Service.

Capt. (Temp. Lieut.-Col.) J. V. Macdonald, M.C., M.B., Indian Medical Service.

Capt. (Temp. Major) M. A. Rahman, Indian Medical Service.

AWARDED THE MILITARY CROSS.

Capt. Richard Reginald Maitland Porter, N.B., Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S. W. 1.
 September 12, 1919.

The King has been graciously pleased to make the following appointment to the Most Exalted Order of the Star of India for meritorious services in connexion with the war in India. The appointment to date from June 3, 1919 :—

To be additional Companion of the said Most Exalted Order :—

Col. Alan Edmondson Tate, C.M.G., Army Medical Service.

CENTRAL CHANCERY OF THE ORDER OF KNIGHTHOOD.

St. James's Palace, S.W. 1.
 September 12, 1919.

The King has been graciously pleased to make the following appointments to the Most Eminent Order of the Indian Empire for meritorious services connected with the war in France. The appointments to date from June 3, 1919 :—

To be additional Companions of the said Most Eminent Order :—

Lieut.-Col. John Bland Jameson, Indian Medical Service (retired).

Major Leonard Hirach, Indian Medical Service.

Lieut.-Col. Samuel James Rennie, Royal Army Medical Corps (retired).

Lieut.-Col. John William Watson, Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1.
 September 12, 1919.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire, in recognition of distinguished services rendered in India in connexion with the war, to be dated June 3, 1919 :—

To be Commander of the Military Division of the said Most Excellent Order :—

Major and Brevet Lieut.-Col. (Temp. Col.) Frederick Adolphus Fleming Barnado, C.I.E., Indian Medical Service.

To be Officers of the Military Division of the said Most Excellent Order :—

Temp. Capt. James Cairns, Royal Army Medical Corps (Territorial Force).

Capt. (Temp. Major) Francis Romney Coppinger, M.B., Royal Army Medical Corps.

Major George Denne Franklin, M.B., Indian Medical Service.

Major Augustine Thomas Frost, M.B., Royal Army Medical Corps.

Capt. William Arthur Frost, Royal Army Medical Corps.

Capt. Trevor Brady Heaton, Royal Army Medical Corps (Special Reserve).

Major David Patrick Johnston, Royal Army Medical Corps.

Major Thomas William Minty, Indian Medical Service.

Lieut.-Col. Paxton St. Clair More, M.B., Indian Medical Service.

Major Roger Brighouse Nicholson, M.C., Indian Medical Service.

Major Harry William Pierpoint, F.R.C.S., Indian Medical Service.

Lieut.-Col. John Joseph Whitworth Prescott, D.S.O., Royal Army Medical Corps.

Capt. Charles Harold Smith, Indian Medical Service.

Capt. (Temp. Major) John Robert Douglas Webb, Indian Medical Service.

Temp. Capt. Sorat Kaikhushru Engineer, Indian Medical Service.

Major (Temp. Lieut.-Col.) John Kenneth Sprot, Indian Medical Service.

To be Member of the Military Division of the said Most Excellent Order :—

Lieut. (Temp Capt.) Paul Xavier Godinbo, Indian Medical Service.

War Office,
September 12, 1919.

The King has been graciously pleased to approve of the undermentioned rewards for valuable services rendered in connexion with the war in India. Dated June 3, 1919 :—

To be Brevet Lieutenant-Colonel :—

Major N. W. Mackworth, M.B., F.R.C.S., Indian Medical Service.

To be Brevet Majors :—

Capt. (Temp. Major) E. E. Doyle, Indian Medical Service.

Capt. (Temp. Major) W. R. Stewart, M.B., Indian Medical Service.

ARMY MEDICAL SERVICE.

Major-Gen. (Temp. Lieut.-Gen.) Sir C. H. Burtchaell, K.C.B., C.M.G., M.B., K.H.S., relinquishes his temporary rank on reposting, April 15, 1919. (Substituted for the notification in the *Gazette* of May 10, 1919.)

Col. S. F. Clark, M.B., retires on retired pay, dated August 10, 1919.

Lieut.-Col. G. W. Brazier-Creagh, C.B., C.M.G., retired pay, is granted the rank of Colonel on ceasing to be re-employed, dated August 22, 1919.

Capt. N. T. Whitehead, M.C., M.B., to be Acting Major whilst specially employed, dated June 25, 1919.

Col. E. M. Hassard is placed on the h.p. list under the provisions of Article 351, Royal Warrant for Pay and Promotion, dated August 10, 1919.

Capt. W. W. MacNaught, M.C., M.B., relinquishes the acting rank of Lieutenant-Colonel on ceasing to command a medical unit, dated March 31, 1919.

Capt. William Oliver Tobias, M.B., from Special Reserve to be Captain, dated February 5, 1918, but not to reckon for pay or allowances prior to August 1, 1919, with precedence next below E. A. Sutton.

Capt. Arnold Guy Harsant, from Special Reserve, to be Lieutenant, and to be Temporary Captain, dated November 2, 1916, but not to reckon for pay or allowances prior to August 1, 1919 with precedence next below W. M. Cameron.

Temp. Lieut. John Egerton Rea, M.B., to be Lieutenant, dated October 3, 1918, but not to reckon for pay or allowances prior to August 1, 1919, with precedence next below C. A. Whitfield.

Col. C. H. Melville, C.M.G., M.B., retires on retired pay, August 10, 1919.

Temp. Lieut.-Col. Herbert L. Eason, C.B., C.M.G., M.D., relinquishes his commission, dated July 1, 1919, and retains the rank of Lieutenant-Colonel. (Substituted for the notification in the *Gazette* of July 31, 1919.)

Major S. M. W. Meadows, D.S.O., relinquishes the temporary rank of Lieut.-Col. on reposting, dated March 17, 1919. (Substituted for the notification regarding this officer in the *Gazette* of May 16, 1919.)

Major and Brevet Lieut.-Col. A. McMunn, O.B.E., relinquishes the temporary rank of Lieut.-Col. on reposting, dated May 23, 1918.

Capt. G. D. Robertson resigns his commission, dated August 19, 1919.

Temp. Capt. Robert Harper Alexander, M.C., M.B., to be Capt., dated February 22, 1918, but not to reckon for pay and allowances prior to August 1, 1919, with precedence next below G. A. E. Argo.

Major D. F. Mackenzie, D.S.O., M.B., relinquishes the acting rank of Lieutenant-Colonel on ceasing to command a medical unit, dated May 24, 1919.

Capt. William Herron Elliott, M.B.E., M.B., from Special Reserve to be Captain, dated May 28, 1918, but not to reckon for pay or allowances prior to August 1, 1919, with precedence next below H. P. Rudolf.

Col. A. W. Bewley, C.M.G., retires on retired pay, September 1, 1919.

Capt. J. E. Hepper relinquishes the acting rank of Major on ceasing to be specially employed, dated July 9, 1919.

Capt. K. P. Mackenzie, M.B., relinquishes the acting rank of Major on ceasing to be specially employed, dated July 28, 1919.

Temp. Capt. John McPhail MacKinnon, M.B., to be Lieut., and to be Temp. Capt., dated January 25, 1919, but not to reckon for pay or allowances prior to July 1, 1919, with precedence next below J. E. Rea. (Substituted for the notification in the *Gazette* of August 9, 1919.)

Major Michael P. Leahy, M.B., retires, receiving a gratuity, dated August 26, 1919.

Capt. A. S. Cane, O.B.E., M.D., relinquishes the acting rank of Major on reposting, dated July 1, 1919.

The notification regarding Capt. H. F. Joynt, M.B., in the *Gazette* of May 20, 1919, is cancelled.

Capt. T. D. Inch, O.B.E., M.C., M.B., resigns his commission, dated July 23, 1919. (Substituted for the notification in the *Gazette* of June 11, 1919.)

The date on which Capt. A. S. Cane, O.B.E., M.D., relinquished the acting rank of Major is July 1, 1919, and not as in the *Gazette* of August 25, 1919.

Major-Gen. Sir M. T. Yarr, C.B., K.C.M.G., to be Inspector of Medical Services (temp), vice Major-Gen. Sir W. Babbie, V.C., K.C.M.G., C.B., K.H.S., dated May 31, 1919.

Lieut.-Col. O. W. A. Elsner, C.B.E., D.S.O., relinquishes the temporary rank of Colonel on reposting, dated June 30, 1919.

Acting Lieut.-Col. D. C. L. Fitzwilliams, M.D., F.R.C.S. (Capt., R.A.M.C., T.F.), relinquishes his temporary commission on reposting, dated July 28, 1919.

Lieut.-Col. M. Boyle, O.B.E., M.B., is placed on retired pay, dated August 24, 1919.

Col. W. L. Gray, C.M.G., M.B., retires on retired pay, August 10, 1919.

Capt. N. T. Whitehead, M.C., M.B., relinquishes the acting rank of Lieutenant-Colonel on ceasing to command a medical unit, dated June 15, 1919.

Capt. D. H. C. MacArthur, M.D., relinquishes the acting rank of Major, dated March 17, 1919. (Substituted for the notification regarding this Officer in the *Gazette* of June 27, 1919.)

Lieut.-Col. Kennett B. Barnett, M.B., F.R.C.S.I., retires on retired pay, dated September 5, 1919.

Major C. M. Drew, D.S.O., M.B., to be acting Lieut.-Col. whilst commanding a medical unit, from June 21 to July 4, 1919.

Capt. A. J. Hickey, M.C., relinquishes the acting rank of Lieut.-Col. on reposting, dated May 16, 1919. (Substituted for the notification regarding this officer in the *Gazette* of July 11, 1919.)

Capt. F. R. H. Mollan, M.C., relinquishes the acting rank of Major on reposting, dated May 16, 1919. (Substituted for the notification regarding this officer in the *Gazette* of July 17, 1919.)

Capt. C. Robb, M.B., retires, receiving a gratuity, dated September 5, 1919.

Temp. 2nd Lieut. A. R. Hockridge relinquishes his commission on account of ill-health contracted on active service, September 4th, 1919, and retains the rank of 2nd Lieut.

Lieut.-Col. G. A. T. Bray, D.S.O., relinquishes the temporary rank of Colonel on ceasing to be specially employed, dated April 24, 1919.

Major and Brevet Lieut.-Col. A. McMunn, O.B.E., relinquishes the temporary rank of Lieutenant-Colonel on reposting, dated May 23, 1919. (Substituted for the notification in the *Gazette* of August 18, 1919.)

Col. S. G. Moores, C.B., C.M.G., Army Medical Service, to be Commandant Royal Army Medical College, May 1, 1919.

Col. C. A. Young, C.B., C.M.G., retires on retired pay, September 15, 1919.

Col. G. T. Rawnsley, C.B., C.M.G., is placed on the half pay list under the provisions of Article 351, Royal Warrant, for pay and promotion, September 15, 1919.

Col. Henry T. Knaggs, C.B., C.M.G., M.B., retires on retired pay, September 15, 1919.

Col. Anthony J. Luther, C.B., retires on retired pay, September 10, 1919.

The undermentioned Lieutenants (Temporary Captains) to be Captains :—

Dated August 4, 1919.—C. H. C. Byrne.

Dated August 8, 1919.—G. C. Robinson.

Dated August 10, 1919.—C. A. Slaughter.

Dated August 15, 1919.—W. L. A. Harrison, M.C.

• Dated August 25, 1919.—T. P. Buist, M.B.

Dated August 29, 1919.—P. H. Wells, M.C.

The undermentioned Majors relinquish the acting rank of Lieutenant-Colonel on reposting :—

Dated February 3, 1919.—W. E. C. Lunn, M.C., M.B.

Dated March 27, 1919.—G. De la Cour, M.B.

Dated April 25, 1919.—R. J. C. Thompson, C.M.G., D.S.O.

Dated May 3, 1918.—Capt. M. White, M.C., M.B.

Dated May 16, 1919.—C. R. M. Morris, D.S.O., M.B.

Dated May 30, 1919.—E. C. Phelan, D.S.O., M.C., M.B.

Dated June 4, 1919.—E. M. Middleton.

Dated June 11, 1919.—W. J. Weston, D.S.O.

Dated July 1, 1919.—C. Scaife, M.D.

Dated July 17, 1919.—N. Low, D.S.O.; W. J. E. Bell, D.S.O., M.B.

The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel on reposting :—

Dated March 31, 1919.—H. B. Fawcus, C.M.G., D.S.O., M.B.

Dated April 15, 1919.—T. C. MacKenzie, D.S.O.

The undermentioned relinquish the acting rank of Lieutenant-Colonel :—

Major and Brevet Lieut.-Col. R. B. Ainsworth, D.S.O., on reposting, dated June 11, 1919.

Major E. B. Booth, on ceasing to be specially employed, dated July 1, 1919.

Major F. L. Bradish, D.S.O., on ceasing to command a medical unit, dated August 4, 1919.

The undermentioned to be Acting Lieutenant-Colonel :—

Dated May 5 to October 1, 1918.—Major M. C. Beatty, M.B., whilst commanding a medical unit.

The undermentioned to be Acting Lieutenant-Colonel whilst specially employed :—

Dated April 14 to June 24, 1919.—Major F. H. M. Chapman.

The undermentioned relinquish the acting rank of Lieutenant-Colonel on reposting :—

Dated May 8, 1919.—Capt. R. M. Davies M.B.

Dated June 23, 1919.—Major G. H. Stevenson, D.S.O., O.B.E., M.B.

Dated August 1, 1919.—Major P. J. Marett.

Dated August 6, 1919.—Major T. F. Ritchie, D.S.O., M.B.

The undermentioned to be Acting Lieutenant-Colonels whilst commanding medical units:—

Dated January 8, 1919.—Major P. C. T. Davy, C.M.G., M.B.

Dated April 25, 1919.—Capt. (Acting Major) R. G. Shaw, M.C., M.B.

Dated June 18, 1919.—Major J. E. H. Gatt, M.D.

Dated June 25, 1919.—Capt. T. S. Eves, D.S.O., M.B.

Dated July 4, 1919.—Capt. E. Percival, D.S.O., M.C., M.B.

The undermentioned Captains relinquish the acting rank of Major:—

Dated October 4, 1918.—C. Kelly, M.C., M.D.

Dated December 6, 1918.—W. C. Hartgill, M.C.

Dated January 12, 1919.—C. H. Brennan, M.C.

Dated January 18, 1919.—R. A. Austin, M.C.

Dated March 3, 1919.—P. A. Opie, M.B.

Dated May 17, 1919.—L. J. Sheil, M.C., M.D.

Dated June 10, 1919.—Capt. and Brevet Major R. E. Barnsley, M.C.

The undermentioned Captains to be acting Majors:—

Dated October 14, 1918.—F. W. Matheson, M.B.

Dated February 12, 1919.—W. E. Adam, M.C., M.D.

Dated February 15, 1919.—E. Catford.

Dated June 21, 1919.—J. Biggam, M.C., M.B.; C. F. Burton, M.C.

The undermentioned to be acting Majors whilst specially employed:—

Dated April 5, 1919.—Capt. F. Worthington, D.S.O., O.B.E., M.B.

Dated from June 12 to 25, 1919.—Capt. H. F. Joynt.

Dated July 1, 1919.—Capt. R. E. Todd, M.B.

Dated July 20, 1919.—Capt. S. H. Smith, M.C.

Dated July 22, 1919.—Capt. and Brevet Major T. A. Weston, M.B.

The undermentioned Captains, from the Territorial Force, to be Captains, but not to reckon for pay or allowances prior to August 1, 1919:—

Dated June 11, 1918.—Gerald Francis Carr, M.C., with precedence next below M. P. Power.

Dated July 1, 1918.—Charles Marsh Gozney, M.C., M.B., with precedence next below S. Robertson.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to August 1, 1919.

Dated June 16, 1918.—Capt. David Stanley Martin, M.B., from Special Reserve, with precedence next below B. H. C. Lea-Wilson.

Dated January 17, 1919.—Temp. Capt. George Oliver Fairclough Alley, M.C., M.B., with precedence next below F. R. H. Mollan.

The undermentioned to be Captains:—

Dated March 19, 1918.—Capt. William Fotheringham, M.C., M.B., from Special Reserve, but not to reckon for pay or allowances prior to August 1, 1919, with precedence next below E. E. Holden.

Dated April 14, 1919.—Temp. Capt. Herbert Mitchell, M.B., but not to reckon for pay or allowances prior to August 1, 1919, with precedence next below W. L. Partridge.

ROYAL ARMY MEDICAL CORPS.

Temp. Capt. J. McFadden, M.B., to be Captain, April 3, 1918, but not to reckon for pay or allowances prior to August 1, 1919, with precedence next below D. Pottinger.

Major and Bt. Lieut.-Col. Garfield Ormrod, M.B., relinquishes the acting rank of Lieut.-Colonel, August 5, 1919.

Temp. Capt. (Acting Major) Reginald Hutchinson Lucas, O.B.E., M.C., to be Captain, June 2, 1918, but not to reckon for pay or allowances prior to July 1, 1919, with precedence next below W. E. Adam, and to retain his acting rank whilst specially employed. (Substituted for the notification in *Gazette* of July 12, 1919).

ROYAL ARMY MEDICAL COLLEGE.

Col. S. L. Cummins, C.B., C.M.G., M.D., to be a Professor, dated July 1, 1919.

The undermentioned to be Assistant Professors:—

Dated July 1, 1919.—Major and Brevet Lieut.-Col. J. A. Anderson, M.B., Royal Army Medical Corps; Major H. M. J. Perry, O.B.E., Royal Army Medical Corps.

NOTE FROM PORTSMOUTH.

COL. E. KEEBLE sends us the following note of the services of Mr. W. J. Peake, late Staff Serjt. Medical Staff Corps:—

"Mr. W. J. Peake entered the Army in July, 1868, at the age of 20, and was posted to the 49th Foot.

"He proceeded to India in February, 1869, where he served with distinction until invalided home in March, 1878, having reached the rank of Quartermaster-Serjeant.

"From 1887 until his discharge from the Army in August, 1889, he served as Chief Clerk at the office of the Principal Medical Officer, Portsmouth, being then placed in charge of the Regimental Institute, Portsmouth Station Hospital, from 1889 to 1899.

"When the South African War broke out he volunteered for and took charge of the office of the Principal Medical Officer, Portsmouth, from 1899 to 1902.

"From 1902 until 1905 he was Pay Clerk to "B" Company Royal Garrison Regiment, and from 1905 to 1906 Pay List Clerk in Regimental Pay Office, Fort Widley.

"In 1906 he was transferred to the Pay Office at Winchester, where he served until 1908, being then transferred to the Pay Office, Portsmouth, serving in this office until February, 1909.

"From 1909 to 1914 he was Pay List Clerk at Brookhurst, and on the outbreak of the Great European War in August, 1914, he took his place once more in the office of the Assistant Director of Medical Services, Portsmouth, where he performed most important duties in a thorough and painstaking manner, only resigning on August 18, 1919, on account of his wife's serious illness.

"In the *London Gazette*, dated September 2, 1918, Pensioner (Ex-Staff-Serjt. Medical Staff Corps) W. J. Peake is mentioned 'For valuable services rendered in connexion with the war' (published in the *JOURNAL OF THE ROYAL ARMY MEDICAL CORPS*, October 4, 1918).

"The above is a splendid record of fifty-one years' continuous good service. During two great national emergencies (the South African and the Great European Wars) this very gallant old soldier came forward willingly and gave most valuable service to his King and Country."

APPOINTMENT OF MEDICAL OFFICER FOR THE TREATMENT OF CASES OF WAR NEUROSIS IN SOUTH AFRICA.

We have received the following letter, which is published for general information :—

UNION OF SOUTH AFRICA.

High Commissioner's Office,
Military Staff Office,
64, Victoria Street,
Westminster, London, S.W.1.
September 19, 1919.

To the Secretary, War Office, Cornwall House, Stamford Street, S.E.1.

SIR,—I am directed to ascertain whether any medical men with sufficient experience—and preferably not too long qualified—can be found at short notice, who can be recommended by your department as suitable to take up the position of Medical Officer for the treatment of cases of war neurosis in South Africa.

The probable terms of engagement would be for one year, and passage would be paid both ways, unless, at the end of the time, the Medical Officer elects to remain in South Africa.

The pay suggested is at the rate of £2 2s. 6d. or £2 5s. per diem.

I am further directed to state that no definite offer of an appointment may be made at the present time, and that the information asked for is required by the Union of the Government of South Africa.

An early reply will greatly oblige as the matter is *very urgent*.

I am, Sir,
Your obedient servant,
(Signed) H. P. MILLS, Major,
For Lieutenant-General, D.D.M.S.,
South African Contingent.

MARRIAGE.

LLOYD—BRANDON.—On August 28, at All Saints' Crondall, Hants, by the Rev. D. Felix, Rector of Aberbeeg, Monmouth (uncle of the bride), assisted by the Rev. W. G. Wickham, Vicar of Church Crookham, Major J. Ross Lloyd, Royal Army Medical Corps, third son of Lieut. Col. and Mrs. J. Hayes Lloyd, of Streatham Hill, to Elsie Beatrice, third daughter of Mr. and Mrs. A. J. Brandon, of Redfields, Church Crookham, Hants.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

Major due for India about New-Year wishes an exchange to remain at home. Good terms offered. Apply T.H.G., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

NUMBER OF REPRINTS	NUMBER OF PAGES	COST OF REPRINTS	COST OF EXCERPTS*	EXTRA FOR COVERS FOR REPRINTS			
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12	4	£ s. d. 0 2 9	£ s. d. 0 1 2	s. d.	s. d.	s. d.	s. d.
	8	0 5 0	0 2 3	4 3	1 1	3 10	0 9
	16	0 8 3	0 3 11				
25	4	0 3 4	0 1 5				
	8	0 6 0	0 2 9	4 10	1 6	4 4	0 11
	16	0 10 6	0 5 0				
50	4	0 4 6	0 1 10				
	8	0 7 6	0 3 6	6 0	2 1	4 10	1 2
	16	0 13 3	0 5 10				
100	4	0 6 0	0 3 1				
	8	0 10 0	0 4 10	7 10	3 11	6 7	2 5
	16	0 18 6	0 7 6				
200	4	0 9 6	0 4 5				
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CASES FOR BINDING VOLUMES.—Strong and useful cases for binding can be obtained from the publishers at the undermentioned rates:—

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The above figures are subject to 50 per cent increase.

All Applications for Advertisements to be made to—

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The back outside cover is not available for advertisements.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 56, Cornwall House, Stamford Street, S.E.1.

Communications have been received from the following: Col. E. Keble, C.M.G., D.S.O., and F. D. Boyd, C.M.G.; Lieut.-Col. P. S. Lelean, C.B., and R. Muir; Capt. H. Stokes, M. E. Mcgregor, J. S. Kellett Smith and A. L. Home.

The following publications have been received:—

British: The Practitioner, The Royal Engineers' Journal, The Medical Press, Indian Medical Gazette, The Medical Journal of Australia, St. Bartholomew's Hospital Journal, The Hospital, Tropical Diseases Bulletin, Guy's Hospital Gazette, The Medical Journal of South Africa, Annals of Tropical Medicine and Parasitology, Public Health, The Journal of Tropical Medicine and Hygiene, Bulletin of Entomological Research, The Quarterly Journal of Medicine, Veterinary Review.

Foreign: Archives de Médecine et Pharmacie Navales, Medicina Militar, Le Bulletin Médical, The American Journal of Syphilis, Le Caducée, Bulletin de l'Institut Pasteur, Colonies et Marine, L'Ospedale Maggiore, The Journal of Infectious Diseases.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," Cornwall House, Stamford Street, S.E. 1, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co." and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,
"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"
CORNWALL HOUSE, STAMFORD STREET, S.E.1.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

. Corps News.

NOVEMBER, 1919.

EXTRACTS FROM THE "LONDON GAZETTE."

War Office,
September 20, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign :—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF ROUMANIA.

Order of the Star of Roumania (Grand Cross).

Grand Officer : Major-Gen. Maurice Percy Cue Holt, K.C.B., K.C.M.G., D.S.O.

Chevalier : Temp. Capt. Francis Charles Hobbs, M.C., Royal Army Medical Corps.

Order of the Crown of Roumania.

Grand Officer : Major-Gen. Alfred Percy Blenkinsop, C.B., C.M.G. ; Major-Gen. James Thomson, C.B., C.M.G., M.B.

Officer : Capt. Arthur Cecil Hays McCullagh, D.S.O., M.B., Royal Army Medical Corps (T.F.).

Chevalier : Captain Herbert Leslie Garson, O.B.E., M.C., Royal Army Medical Corps (Special Reserve) ; Capt. Frederick Jefferson, M.B., Royal Army Medical Corps (Special Reserve) ; Temp. Capt. John Norman Lonsdale Thoseby, M.B., Royal Army Medical Corps.

Croix de Virtute Militara.

1st Class.—416051 Cpl. (Acting Serjt.) Harry Andrews, Nottinghamshire and Derbyshire Brigade Field Ambulance, Royal Army Medical Corps (Territorial Force) ((E) South Stoke) Stoke.

2nd Class.—475165 Lance-Cpl. Wilfred Harris, 1/2nd East Anglian Field Ambulance, Royal Army Medical Corps (Territorial Force) (Hunstanton).

Medaille Barbatie si Credinta.

2nd Class.—55372 Cpl. Alexander Ormiston McLaggan, 19th Casualty Clearing Station, Royal Army Medical Corps (Leith) ; 36205 Serjt. Reddy, 1/1st (Welsh Border) Mounted Brigade Field Ambulance, Royal Army Medical Corps (Territorial Force) (Chester).

3rd Class.—66407 Pte. Ernest Ashton, Royal Army Medical Corps (Cardiff) ; 3686 Serjt. Ernest Henry Forster, Royal Army Medical Corps (Salford) ; 89941 Pte. Alfred Harry Hill, Royal Army Medical Corps (Nottingham) ; 315007 Serjt. Matthew Paul, 229th Field Ambulance, Royal Army Medical Corps (Territorial Force) (Partick) ; 388147 Pte. Andrew Snowball, 1/2nd Northumberland Field Ambulance, Royal Army Medical Corps (Territorial Force) (Shildon, Co. Durham) ; 49945 Pte. (Acting Lance-Cpl.) William Henry Taylor, 1/2nd Northumbrian Field Ambulance, Royal Army Medical Corps (Territorial Force) (Bolton).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.

Gold Medal for Valour.

50808 Pte. (Acting Lance-Cpl.) Robert Blyth, M.M., Royal Army Medical Corps (Dundee) ; 95211 Cpl. (Acting Serjt.) John Thomas Hadlow, M.M., Royal Army Medical Corps (Territorial

Force) (Canterbury); 493007 Serjt. Arthur Henry Holtum, Royal Army Medical Corps (Territorial Force) (Maidstone); 63393 Pte. Herbert Calverley, M.M., Royal Army Medical Corps (Rochdale); 510131 Pte. Frank Palmer, Royal Army Medical Corps (Territorial Force) (Kilburn, N.W.); 493745 Staff-Serjt. Alfred Sparkes, M.M., Royal Army Medical Corps (Bayswater, W.).

Silver Medal for Valour.

300137 Serjt. Adam Alexander, Royal Army Medical Corps (Territorial Force) ((E) Aberdeen).

CORRECTIONS.

London Gazette, No. 31465, dated July 21, 1919.

Military Order of Avis.

Commander. Page 9235. Major (Acting Lieut.-Col.) James Hamilton Campbell, D.S.O., M.B., Royal Army Medical Corps.

War Office,

October 3, 1919.

His Majesty the King has been graciously pleased to approve of the following immediate awards for conspicuous gallantry and devotion to duty in North Russia, conferred by Major Gen. W. E. Ironside, K.C.B., C.M.G., D.S.O., in pursuance of the powers vested in him by His Majesty :—

ARCHANGEL COMMAND.

Awarded the Military Cross.

Lieut. John Morrison, M.B., Royal Army Medical Corps, Special Reserve.

He has done exceptional work since joining the battalion. He superintended the successful evacuation of wounded on October 12, 1918, at Seltso, under shell fire, at short notice. He accompanied the attacking forces when Topsa was attacked, and gallantly carried on his work under close enemy fire. By his energy and devotion to duty throughout these operations he was the means of saving many lives.

COMMUNIQUE.

N.B.—This list is for publication in the Press only, and will not be gazetted.

War Office,

August 28, 1919.

The names of the undermentioned have been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the War, and, when applicable, an entry will be made in the records of service of officers and other ranks :—

GREAT BRITAIN.

Aldershot Command.

Royal Army Medical Corps.

Temp. Capt. A. D. Ball, Special List (attached).	Lieut.-Col. W. Turner, C.M.G.
Temp. Major T. W. Eden, M.D., F.R.C.S.	Capt. (Acting Lieut.-Col.) A. G. Wells, D.S.O.
Temp. Major T. Rankin, Special List (attached).	

Eastern Command.

Army Medical Service.

Col. C. R. Elliott, M.D. (retired pay).	Col. A. D. Sharp, C.B., C.M.G., F.R.C.S.E.
Col. G. T. Goggin, (retired pay).	(T.F.).

Royal Army Medical Corps.

Major G. F. Alexander, M.B.	Temp. Capt. H. A. Hancock.
Lieut.-Col. T. Archer, M.D.	Temp. Qmr. and Capt. L. F. Hayman.
Capt. C. N. Atlee, (T.F.).	Temp. Major H. Irving, M.B., F.R.C.S.
Temp. Capt. H. E. Bates.	Temp. Capt. H. R. Johnston.
Temp. Capt. H. E. Batton.	Temp. Major W. F. Jones.
Temp. Capt. R. L. Bell.	Temp. Qmr. and Capt. G. H. Kelf.
Capt. H. J. Blacker, M.B.	Temp. Capt. W. Kirk, M.D.
Temp. Major W. A. Chapple, M.D.	Qmr. and Major E. Lines.
Qmr. and Capt. W. M. Clarke.	Capt. A. K. MacLachan, M.B. (T.F.).
Temp. Capt. J. B. Dalton, M.D.	Temp. Capt. (Acting Major) A. E. Marsack.
Temp. Capt. L. Dinis, Special List (attached).	Capt. (Acting Major) L. J. E. Matthews, M.B.
Temp. Capt. J. W. Edington.	(T.F.).
Temp. Qmr. and Capt. E. Fry.	Capt. (Acting Major) L. J. E. McHugh, M.B.
Temp. Qmr. and Capt. G. Gerhold.	(T.F.).
Capt. (Acting Major) A. J. M. Gibson. (T.F.).	Temp. Major A. Neve, F.R.C.S. Edin.
Temp. Capt. G. D. Gripper.	Temp. Major A. O'Neill.

Temp. Capt. W. E. Passmore.
 Major W. V. D. Patterson, (T.F.) (Lieut.-Col. T.G. Reserve).
 Temp. Capt. F. J. Rawlinson, F.R.C.S.
 Capt. (Acting Major) W. Redpath, M.B. (T.F.).
 Temp. Capt. J. Kenwick, M.B.
 Temp. Lieut.-Col. L. W. Rolleston, M.B.
 Capt. T. M. Savage.
 Temp. Qmr. and Capt. J. T. Scott.
 Temp. Capt. (Acting Major) G. A. Skinner.
 Temp. Major E. Swainstone, M.D.
 Temp. Capt. (Acting Major) A. W. Tabuteau, F.R.C.S.
 Temp. Capt. M. E. A. Wallis.
 Lieut.-Col. G. E. Wherry, M.B., F.R.C.S. (T.F.).
 107049 Pte. (Acting Qmr.-Serjt.) L. F. Allengame.
 481002 Qmr.-Serjt. (Temp. Serjt.-Major) R. W. Allpress.
 17257 Staff-Serjt. (Acting Serjt.-Major) J. J. Bartlett.
 5599 Serjt. O. E. Battram.
 106014 Pte. (Acting Cpl.) H. Bell.
 84828 Pte. (Acting Cpl.) C. A. Benbow.
 36772 Serjt. (Acting Staff Serjt.) B. J. Bennett.
 90662 Serjt. L. G. Bretsch.
 23156 Serjt. (Acting Staff-Serjt.) A. F. Brown.
 26964 Staff-Serjt. J. G. Butler.
 25368 Cpl. (Acting Qmr.-Serjt.) L. H. Cade.
 19464 Serjt. (Acting Staff-Serjt.) R. R. Chamberlain.
 51528 Serjt. (Acting Staff-Serjt.) R. R. Crouch.
 66150 Cpl. A. C. Curtis.
 24656 Pte. W. J. Day.
 22282 Pte. (Acting Serjt.) G. W. Derrick.
 25800 Staff-Serjt. G. J. Dolan.
 553009 Cpl. (Acting Serjt.) C. Dyson.

107019 Serjt.-Major F. Elms.
 25960 Cpl. (Acting Qmr.-Serjt.) W. G. Fowler.
 102725 Pte. F. Greenwood.
 4181382 Cpl. J. Hastie.
 39305 Pte. (Acting Serjt.) C. C. Hayes.
 28460 Cpl. (Acting Staff-Serjt.) H. Hirst.
 104863 Serjt. A. Holmes.
 10441 Pte. (Acting Serjt.) W. Kershaw.
 500012 Serjt. W. Leeson.
 104158 Cpl. (Acting Regimental Serjt.-Major) T. Lennox.
 488001 Qmr.-Serjt. (Acting Serjt.-Major) H. S. Manning.
 29305 Cpl. (Acting Staff-Serjt.) G. Martin.
 24372 Serjt. (Acting Staff-Serjt.) J. J. Morgan.
 24930 Staff-Serjt. (Temp. Regimental Serjt.-Major) A. F. Neal.
 500010 Qmr.-Serjt. A. Neasham.
 84325 Pte. (Acting Qmr.-Serjt.) W. J. Nickolls.
 26936 Cpl. (Acting Staff-Serjt.) R. Paish.
 5081 Qmr.-Serjt. (Temp. Regimental Serjt.-Major) F. S. Parton.
 26882 Qmr.-Serjt. C. Pitkin.
 26284 Serjt. A. A. Raynor.
 39251 Serjt.-Major F. Reason.
 28222 Cpl. (Acting Staff-Serjt.) W. Saunders.
 25834 Serjt. (Acting Staff-Serjt.) A. O. Sayner.
 100273 Pte. (Acting Cpl.) W. H. Sherwood.
 25584 Qmr.-Serjt. E. J. Stiles.
 324014 Cpl. (Acting Serjt.) W. G. Tait.
 26200 Pte. (Acting Cpl.) W. C. Terry.
 98820 Pte. (Acting Serjt.) F. C. Timbrell.
 100053 Serjt. (Acting Staff-Serjt.) H. A. Vaughan.
 25952 Serjt.-Major E. E. Wallis.
 26216 Staff-Serjt. (Acting Qmr.-Serjt.) W. J. Wooler.

London District.

Royal Army Medical Corps.

515032 Serjt. H. J. Adams (T.F.).
 543021 Pte. (Acting Qmr.-Serjt.) A. E. Allen (T.F.).
 519034 Pte. (Acting Cpl.) S. B. Anderson (T.F.).
 67536 Pte. (Acting Cpl.) S. Ayling.
 22215 Serjt. W. Baggalay.
 543038 Pte. (Acting Serjt.) F. Beswick.
 519021 Serjt.-Major H. D. Bond (T.F.).
 36802 Pte. J. H. Bowlden.
 15724 Cpl. (Acting Staff-Serjt.) C. H. Bush.
 83901 Pte. (Acting Serjt.) J. Byworth.
 11532 Serjt. (Acting Serjt.-Major) A. Callander.
 8653 Cpl. (Acting Serjt.) J. J. Canty.
 543175 Pte. (Acting Serjt.) A. J. Cawley (T.F.).
 9723 Serjt. A. J. Chandlely.
 23180 Serjt. F. Colyer.
 543149 Pte. (Acting Staff-Serjt.) Connolly.
 72334 Pte. H. Cook.
 541015 Serjt.-Major G. Cowie (T.F.).
 100219 Cpl. (Acting Staff-Serjt.) H. E. Craft.
 515073 Serjt. H. R. Cuzner (T.F.).
 112696 Pte. J. Dane.
 9831 Serjt.-Major C. H. Darker.
 24334 Serjt. (Acting Staff-Serjt.) G. H. Davy.
 Cpl. (Acting Qmr.-Serjt.) W. D. Deane (T.F.).
 104318 Pte. (Acting Serjt.) A. W. J. Denney.
 543143 Pte. (Acting Serjt.) F. L. Down (T.F.).

451022 Pte. C. Druett.
 515098 Serjt. J. E. Elliott (T.F.).
 24725 Staff-Serjt. J. Ellis.
 9837 Serjt. (Acting Staff-Serjt.) J. A. Elvin.
 541089 Staff-Serjt. W. B. Fagan, (T.F.).
 517001 Serjt.-Major W. H. Ford (T.F.).
 515058 Cpl. G. Fruin (T.F.).
 515031 Qmr.-Serjt. R. Garrard (T.F.).
 538578 Pte. (Acting Cpl.) W. M. Gay (T.F.).
 543016 Serjt. (Acting Serjt.-Major) W. C. Gibbs (T.F.).
 21665 Serjt. (Acting Qmr.-Serjt.) W. Gill.
 22635 Cpl. A. E. Gillison.
 90728 Pte. (Acting Cpl.) F. H. Glover.
 543036 Pte. (Acting Staff-Serjt.) W. L. Godfrey (T.F.).
 72515 Pte. W. H. Goode.
 510365 Serjt. R. G. Goodfellow (T.F.).
 85067 Pte. (Acting Serjt.) H. Goodman.
 17205 Pte. H. Hall.
 541133 Pte. F. Hampton (T.F.).
 56098 Qmr.-Serjt. D. W. Hannan.
 20167 Serjt. A. D. Harris.
 515018 Serjt. W. T. Harris (T.F.).
 541138 Cpl. M. L. Hart (T.F.).
 24002 Qmr.-Serjt. C. A. Hawken.
 2305 Pte. (Acting Cpl.) F. G. Hewitt.

541179 Cpl. E. C. Hicks (T.F.).
 519041 Pte. A. W. Honey (T.F.).
 111775 Pte. R. W. Honeyman.
 31411 Qmr.-Serjt. G. Hooker.
 103351 Pte. W. Jacques.
 102270 Pte. A. G. Jeffries.
 23232 Cpl. A. Jenvey.
 512217 Qmr.-Serjt. H. E. Johnson (T.F.).
 746069 Pte. (Acting Staff-Serjt.) W. Jones (T.F.).
 543074 Serjt. (Acting Qmr.-Serjt.) R. S. Kent (T.F.).
 11353 Serjt.-Major M. E. Lackey.
 101510 Pte. (Acting Staff-Serjt.) C. Lambert.
 16304 Staff-Serjt. (Acting Serjt.-Major) A. Langley.
 111848 Pte. S. Legg.
 515161 Pte. W. T. Leighton (T.F.).
 24753 Cpl. W. C. Lofige.
 112058 Pte. J. Lomax.
 57550 Pte. (Acting Serjt.) C. E. Mason.
 4203 Pte. G. McAteer.
 58008 Qmr. Serjt. B. McKenna.
 28956 Pte. (Acting Serjt.) T. G. Mingay.
 928 Cpl. (Acting Staff-Serjt.) W. Morris.
 84892 Bte. (Acting Serjt.) H. Nelson.
 19324 Pte. (Acting Serjt.) J. O'Brien.
 103771 Pte. J. H. Oliver.
 22349 Staff Serjt. C. H. Orchard.
 21862 Serjt. A. D. Owen.
 515028 Qmr.-Serjt. C. F. Palmer (T.F.).
 112312 Pte. (Acting Cpl.) E. V. Phillips.
 55311 Pte. C. B. Pick.
 103368 Pte. A. P. Pickup.
 508427 Pte. (Acting Staff-Serjt.) H. E. T. Poole (T.F.).
 83864 Pte. (Acting Serjt.) H. H. Pooley.
 37629 Pte. (Acting Cpl.) S. Poulton.
 543041 Pte. (Acting Serjt.-Major) L. B. Prestige (T.F.).
 22702 Staff Serjt. (Acting Serjt.-Major) F. J. Rhodes.

515074 Staff Serjt. W. Roberts (T.F.).
 56999 Pte. (Acting Cpl.) E. Robinson.
 543174 Pte. (Acting Cpl.) S. G. Rogers (T.F.).
 103548 Qmr. Serjt. A. W. Rowe.
 103548 Pte. (Acting Cpl.) N. Rowbottom.
 29864 Serjt. W. Ruddock.
 536432 Cpl. (Acting Serjt.) F. G. Sanders (T.F.).
 161220 Pte. (Acting Serjt.) W. A. Saunders.
 543131 Pte. W. Scott (T.F.).
 1480 Pte. J. J. Shippey.
 519017 Serjt. (Acting Staff-Serjt.) W. Sims (T.F.).
 519001 Cpl. (Acting Staff-Serjt.) G. H. Sinclair (T.F.).
 56361 Pte. A. J. Smith.
 541038 (Serjt.-Major) C. E. Smith (T.F.).
 528138 (Serjt.-Major) E. Smith (T.F.).
 99916 Pte. E. E. Smith.
 541137 Staff-Serjt. G. D. Stamford (T.F.).
 543097 Staff-Serjt. T. R. Stenner (T.F.).
 519009 Pte. G. Stone (T.F.).
 541043 Qmr.-Serjt. C. S. Tanner (T.F.).
 543040 Pte. (Acting Qmr.-Serjt.) H. J. Taunt (T.F.).
 21879 Pte. (Acting Serjt.) H. Taylor.
 28060 Cpl. (Acting Staff-Serjt.) F. G. Terry.
 66914 Pte. (Acting Lance-Serjt.) A. E. Thomas.
 23660 Staff Serjt. T. F. Timmins.
 10713 Serjt. (Acting Qmr.-Serjt.) P. M. Tod.
 22262 Cpl. (Acting Serjt.) G. Walker.
 37810 Staff Serjt. A. Waters.
 22708 Cpl. (Acting Staff-Serjt.) D. T. White.
 33883 Serjt. J. W. White.
 11827 Serjt. W. White.
 140132 Pte. (Acting Serjt.) J. Winder.
 102271 Pte. (Acting Serjt.) S. Woolf.
 107874 Pte. (Acting Serjt.) S. E. Wrigglesworth.
 17727 Qmr.-Serjt. A. Wrigley.
 9855 Cpl. (Acting Staff Serjt.) A. Young.
 16424 Serjt. (Acting Company Qmr.-Serjt.) J. W. Farrant. Royal Defence Corps (T.F.).

Northern Command.

Army Medical Service.

Col. A. Connell (T.F.).

Royal Army Medical Corps.

Capt. G. P. Anning (T.F.).
 Major G. Ashton, M.D. (T.F.).
 Qmr. and Capt. C. E. Barfield (T.F.).
 Lieut.-Col. A. G. Barrs, M.D., F.R.C.P. (T.F.).
 Lieut.-Col. and Brevet Col. H. L. Battersby (R.P.).
 Lieut.-Col. T. Beattie, M.D. (T.F.).
 Temp. Lieut.-Col. J. J. G. Blandford.
 Capt. (Acting Major) L. R. Braithwaite, M.B., F.R.S.C. (T.F.).
 Temp. Major A. S. Brander, M.C.
 Capt. J. le F. C. Burrow (T.F.).
 Temp. Capt. J. Cameron, Special List (attached).
 Major R. H. Clement (R.P.).
 Major J. A. Coupland, M.B., F.R.C.S. (T.F.).
 Temp. Lieut.-Col. E. C. Coward, M.B.
 Temp. Capt. (Acting Major) B. Cox, M.D.
 Temp. Lieut. Col. H. H. Curgrave.
 Major H. L. de Legh, T. D., M.D. (T.F.).
 Qmr. and Capt. F. G. C. Dixon (T.F.).

Temp. Capt. (Acting Major) J. MacF. Donnan, M.B.
 Temp. Capt. (Acting Major) H. G. Brake-Brockman.
 Temp. Qmr. and Capt. J. L. Driver.
 Qmr. and Capt. F. Evenden.
 Major E. F. Finch, M.D. (T.F.).
 Lieut.-Col. W. M. Gabriel, T.B. (T.F.).
 Major F. S. Genney, M.B. (T.F.).
 Capt. (Acting Major) J. Gossip, M.B. (S.R.).
 Lieut.-Col. (Acting Col.) E. V. Gostling, D.S.O. (T.F.).
 Temp. Major C. D. O. Grange, M.B., F.R.C.S.
 Capt. W. J. Gray, (T.F.).
 Capt. (Acting Major) A. Griffith, M.D. (T.F.).
 Major A. R. Hallam, M.D. (T.F.).
 Lieut.-Col. F. Harvey.
 Capt. G. C. Hayes, F.R.C.S. (T.F.).
 Temp. Capt. J. K. Healy, M.B.
 Temp. Major T. E. Holmes, M.D.
 Major (Acting Lieut.-Col.) H. E. J. A. Howley.

Major (Acting Lieut.-Col.) J. K. Jamieson, M.B. (T.F.).
 Major W. W. Jones, M.D. (T.F.).
 Temp. Capt. H. Keighley.
 Capt. G. S. Levis (T.F.).
 Capt. A. A. H. Lowe, M.B. (T.F.).
 Temp. Major F. R. Lucas (Major 9th Bn. R. Scots) (T.F.).
 Lieut.-Col. W. M. Mackay, C.M.G., T.D. M.D. (T.F.).
 Major W. M. Mackay, M.B. (T.F.).
 Temp. Major J. M. Macmillan, M.B.
 Temp. Major H. D. Macphail, M.D.
 Temp. Capt. H. A. Mahony.
 Capt. J. W. Malim (T.F.).
 Lieut.-Col. A. Martin.
 Capt. H. Mason, M.D. (T.F.).
 Temp. Major J. M. Mathieson, M.B.
 Capt. J. P. Matthews (T.F.).
 Temp. Capt. (Acting Major) J. Maxwell, M.D.
 Major J. B. McBride (T.F.).
 Capt. A. Miller, M.B. (T.F.).
 Temp. Capt. E. Montgomery, F.R.C.S.I.
 Lieut.-Col. W. Murray, R.F.A. (T.F.), attached.
 Temp. Capt. (Acting Major) J. P. Musson.
 Lieut.-Col. S. Nestfield, T.D. (T.F.).
 Major S. Newfield (T.F.).
 Temp. Capt. H. Park, M.D.
 Temp. Qmr. and Capt. E. J. Parslow.
 Temp. Major J. Phillips, F.R.C.S.
 Qmr. and Capt. A. Pinnington (T.F.).
 Major S. W. Plummer, M.D. (T.F.).
 Temp. Capt. P. L. Pollard, M.B.
 Capt. A. Richardson, M.B., F.R.C.S. (T.F.).
 Temp. Major A. Robertson, M.B.
 Capt. (Acting Major) W. A. Robertson, M.B. (T.F.).
 Temp. Major J. G. Rowell.
 Major H. A. Rudyard, T.D. (T.F.).
 Temp. Lieut.-Col. A. Russell.
 Temp. Lieut.-Col. W. Scatterry.
 Temp. Capt. W. C. Sharpe, M.D.
 Major G. A. C. Shipman, M.B. (T.F.).
 Capt. (Temp. Major) G. S. Simpson, F.R.C.S. (T.F.).
 Qmr. and Capt. A. Sinfeld (T.F.).
 Major J. D. Slight, M.D. (T.F.).
 Temp. Capt. R. S. Snowie, M.B.
 Temp. Major T. C. Sqaunce, M.D., F.R.C.S.
 Major E. C. Stack, F.R.C.S.I.
 Major (Acting Lieut.-Col.) W. H. M. Telling, M.D. (T.F.).
 Capt. S. Thompson, M.B. (T.F.).
 Major (Acting Lieut.-Col.) W. Thompson, F.R.C.S. (T.F.).
 Major W. E. F. Tinley, M.D. (T.F.).
 Temp. Major R. H. Trotter, M.D.
 Major C. B. Turner (T.F.).
 Temp. Qmr. and Capt. W. H. Turner.
 Capt. C. Tweedy (T.F.).
 Capt. (Acting Major) C. W. Vining, M.D. (T.F.).
 Lieut.-Col. J. A. Wait, T.D., R.G.A. (T.F.), attached.
 Temp. Capt. R. E. Walker, M.B., F.R.C.S. Edin.
 Major and Brevet Lieut.-Col. J. W. Watson, M.D., F.R.C.P. (T.F.).
 Col. A. E. I. Wear, C.M.G., M.D. (T.F.).
 Qmr. and Capt. F. J. Weaver (T.F.).
 Temp. Major W. H. Whitehouse, M.D.

Temp. Capt. J. B. Whitfield, M.B.
 Temp. Qmr. and Capt. F. Wilson.
 Temp. Capt. T. L. Wormald, M.B.
 Temp. Major J. C. Wright, M.B.
 Major A. G. Yates, M.D. (T.F.).
 Lieut.-Col. G. H. Younge, F.R.C.S.I. (retired pay).
 106837 Qmr.Serjt. S. Auty.
 424029 Cpl. (Acting Qmr.-Serjt.) F. Babington.
 277002 Pte. (Staff-Serjt.) A. J. Barton, 322nd Field Ambulance.
 426081 Staff-Serjt. A. H. J. Bastick.
 21974 Pte. (Acting Cpl.) W. E. Bibby.
 101141 Cpl. H. Billington.
 22214 Cpl. R. E. Blackburn.
 23770 Pte. (Acting Cpl.) C. F. Bolam.
 111080 Pte. C. H. Bones.
 030259 Lance-Cpl. G. Boughton.
 23772 Pte. (Acting Serjt.) R. Boyd.
 27856 Cpl. A. Brignell.
 24972 Cpl. H. Brooke.
 24485 Staff-Serjt. J. Brown.
 95153 Pte. W. Br wn.
 408450 Qmr.-Serjt.) H. Brunton.
 393103 Cpl. (Acting Staff-Serjt.) W. Buglass.
 393022 Staff-Serjt. R. Caw.
 408 18 Serjt. J. W. Chadwick.
 426186 Staff-Serjt. H. E. Clarke.
 409205 Serjt. (Acting Staff-Serjt.) F. H. Clift.
 28868 Qmr.-Serjt. J. W. Colclough.
 27400 Serjt. G. A. Collinson.
 80789 Pte. J. H. Cooke.
 408058 Pte. (Acting Serjt.-Major) P. Cordingly.
 106584 Serjt. C. Craven.
 393003 Acting Serjt. A. Daley.
 9717 Staff-Serjt. W. H. Deuton.
 27860 Staff-Serjt. H. Deyes.
 106341 Staff-Serjt. A. W. Dobson.
 26042 Serjt. J. A. Drury.
 51409 Cpl. F. Eckersley.
 393004 Qmr.-Serjt. (Acting Serjt.-Major) E. J. Forster.
 401186 Pte. Fox.
 393005 Qmr.-Serjt. J. J. Gibson.
 401469 Serjt. J. H. Gloyne.
 105309 Serjt. F. B. Gordon.
 410069 Staff-Serjt. W. H. Hancock.
 103825 Cpl. J. Haigh.
 393064 Serjt. N. Heron.
 11841 Serjt.-Major S. R. Holmes.
 040325 Pte. S. H. Hope.
 23011 Staff-Serjt. F. W. Hornby.
 105284 Pte. Hudson.
 115912 Pte. J. E. Jeffreys.
 61053 Cpl. H. Jenkins.
 106608 Cpl. W. Jones.
 106087 Pte. H. Kellett.
 388442 Pte. J. R. Laws.
 12293 Coy. Qmr.-Serjt. W. E. Lawson.
 18727 Serjt. (Acting Staff-Serjt.) T. M. Lewis.
 23024 Qmr.-Serjt. C. G. Lockwood.
 426151 Staff-Serjt. D. S. Mawbey.
 393007 Qmr.-Serjt. R. Messer.
 27250 Cpl. (Acting Staff-Serjt.) G. Middlemiss.
 393046 Serjt. (Acting Staff-Serjt.) W. C. Millard.
 424070 Pte. (Acting Cpl.) A. D. Miller.
 457038 Serjt. D. S. Milman.
 401468 Serjt. W. Mortimer.
 96077 Pte. (Acting Serjt.) H. Niman.

24521 Qmr.-Serjt. R. J. Nisbett.
 105706 Cpl. G. F. Parker.
 120474 Pte. H. J. Parry.
 28044 Qmr.-Serjt. W. J. Pigott.
 35093 Staff-Serjt. J. J. Platts.
 388501 Pte. (Acting Cpl.) W. Ranft.
 83419 Pte. (Acting Cpl.) J. A. Reddie.
 408032 Qmr.-Serjt. A. R. Reilly.
 61764 Serjt. H. Richard.
 410025 Staff-Serjt. J. W. Richardson.
 23862 Serjt. R. Riddle.
 23876 Qmr.-Serjt. A. Seabridge.
 424031 Serjt. (Acting Staff-Serjt.) J. P. Sharman.
 408137 Staff-Serjt. J. Sheard.
 448229 Acting Serjt. A. Smith.
 25017 Qmr.-Serjt. W. Smith.
 31301 Staff-Serjt. A. J. Spencer.
 32157 Serjt.-Major H. J. Stacey.

408028 Serjt.-Major C. W. Steel.
 104832 Serjt. G. W. Thompson.
 137476 Pte. T. H. Thompson.
 407066 Serjt. C. W. Thornley.
 120093 Acting Serjt. J. B. Wadham, 322nd
 (Welsh) Field Ambulance (T.F.).
 424056 Staff-Serjt. (Temp. Serjt.-Major) J. C.
 Walker.
 32930 Pte. J. J. Ward.
 310073 Serjt. E. M. Watson.
 23097 Pte. (Acting Serjt.) J. W. Watson.
 105317 Staff-Serjt. M. A. Wheeldon.
 89867 Cpl. S. Whitten.
 410194 Serjt.-Major R. Whitworth.
 393014 Staff-Serjt. (Acting Qmr.-Serjt.) W.
 Wilkinson.
 410092 Staff-Serjt. J. Wrigley.
 26618 Serjt. H. S. Dixon, E. York Regiment.

Scottish Command.

Army Medical Service.

Col. E. Butt, F.R.C.S.I. (retired pay).

Major-Gen. J. B. Wilson.

Royal Army Medical Corps.

Capt. (Temp. Major) C. N. Anderson, M.B. (T.F.).
 Capt. (Acting Lieut.-Col.) W. Brown.
 Temp. Capt. A. Campbell, M.B.
 Lieut.-Col. (Temp. Col.) H. Chaffer, F.R.C.S.
 Capt. W. C. Davidson, M.B. (Special Reserve).
 Major and Brevet Lieut.-Col. E. S. Forde
 (T.F.) (Major 5th Battalion K.O.S.B. T.F.).
 Temp. Capt. (Acting Major) D. J. Glen, M.B.
 Lieut.-Col. J. B. Hamieson, T.D. (T.F.).
 Major J. W. B. Hodsdon, M.D., F.R.C.S. Edin.
 (T.F.).

Major A. MacGillivray, M.B. (T.F.).
 Major W. J. Mackinnon, M.B., T.D. (T.F.).
 Lieut.-Col. A. Mackintosh, M.D. (T.F.).
 Temp. Lieut.-Col. H. C. Marr, M.D.
 Capt. J. C. McKenzie, M.B. (T.F.).
 Capt. (Acting Major) A. A. McWhan, M.B.
 (T.F.).
 Lieut.-Col. J. Mill, V.D., M.B. (T.F.).
 Lieut.-Col. A. D. Moffat, T.D., M.D. (T.F.).
 Temp. Hon. Major A. McD. Westwater.

Southern Command.

Army Medical Service.

Col. A. W. Bewley, C.M.G.
 Col. C. H. Melville, C.M.G., M.B.

Col. and Hon. Major-Gen. W. F. Stevenson,
 C.B., M.B., K.H.S.

Royal Army Medical Corps.

Major G. S. Abram, M.B. (T.F.).
 Temp. Capt. M. Ashley, M.B.
 Lieut. F. J. Babb, Dorset (Vols.).
 Major E. C. Bevers, M.B. (T.F.).
 Capt. (Acting Major) C. W. J. Brasher, M.D.
 (T.F.).
 Lieut.-Col. W. T. Brooks, M.B. (T.F.).
 Temp. Capt. H. H. Butcher.
 Capt. (Acting Major) A. Campbell (T.F.).
 Temp. Capt. E. K. Campbell, M.B., F.R.C.S.
 Temp. Capt. H. G. Carlisle, M.D.
 Capt. F. Clarke (T.F.).
 Lieut.-Col. W. G. Clements.
 Lieut.-Col. W. M. D. Collier (T.F.).
 Capt. J. M. Courtney (Special Reserve).
 Lieut. Col. C. W. Craig (T.F.).
 Temp. Capt. T. H. R. Crowle, F.R.C.S.
 Major E. J. Davies-Taylor (T.F.).
 Temp. Capt. (Acting Major) N. M. B. Dunn.
 Temp. Capt. C. E. Fenn, M.D.
 Temp. Capt. E. L. Z. Firkling.
 Capt. W. J. Fo-ter, F.R.C.S. (T.F.).
 Temp. Capt. J. C. Fox.
 Temp. Capt. K. Fraser, M.D.
 Major A. G. Gibson, M.D. (T.F.).
 Temp. Capt. J. C. Glen.

Lieut.-Col. G. H. Goddard, D.S.O.
 Qmr. and Capt. A. W. Grant.
 Capt. A. Gregor, M.D. (T.F.).
 Temp. Capt. A. F. Hewat, M.B., F.R.C.P. Edin.
 Lieut.-Col. E. P. Hewitt.
 Temp. Qmr. and Capt. W. E. Hill.
 Capt. G. H. R. Holden, M.D. (T.F.).
 Temp. Capt. E. Huntley, M.B.
 Temp. Capt. W. M. M. Jackson, M.D.
 Capt. S. Jones (T.F.).
 Temp. Capt. H. Joslen, M.D.
 Capt. and Brevet Major J. L. Joyce, F.R.C.S.
 (T.F.).
 Capt. A. D. Kettlewell (T.F.).
 Temp. Capt. B. L. Livingstone-Learmouth,
 M.B.
 Temp. Capt. G. E. Lockyer.
 Temp. Major G. E. MacLeod.
 Lieut.-Col. C. W. S. Magrath, M.D.
 Temp. Capt. J. N. Martin, M.B.E.
 Temp. Capt. (Acting Major) W. Martin, M.B.
 Lieut.-Col. A. R. Master, M.B.
 Major A. E. Milner, Reserve of Officers.
 Temp. Major E. M. J. O'Farrell, F.R.C.S.I.
 Lieut. (Temp. Capt., Acting Major) G. R.
 Cram, 9th Batt., London Regt. attached.

Major W. J. Orr (T.F.).
 Major J. Orton, M.D. (T.F.).
 Capt. H. R. Parsloe (T.F.).
 Lieut.-Col. E. G. Peck, D.S.O., T.D.
 Capt. T. S. Pettitt (T.F.).
 Temp. Capt. H. W. Pigeon, M.D.
 Temp. Qmr. and Capt. W. H. J. Pontin.
 Major W. P. Purvis, M.D., F.R.C.S. (T.F.).
 Temp. Qmr. and Lieut. J. J. B. Rampton.
 Temp. Capt. (Acting Major) H. E. Rawlence,
 M.B., F.R.C.S. Edin.
 Temp. Capt. G. Y. Richardson, M.D.
 Temp. Capt. C. H. L. Rixon.
 Capt. E. W. S. Rowland (T.F.).
 Major and Brevet Lieut.-Col. (Acting Lieut.-
 Col.) J. E. H. Sawyer, M.D. (T.F.).
 Temp. Capt. W. A. Shirvell
 Major C. E. G. Stalkartt, M.D., Reserve of
 Officers.
 Major E. G. Stocker (T.F.).
 Capt. W. A. Stokes (T.F.).
 Capt. J. W. Stretton (T.F.).
 Temp. Lieut.-Col. A. C. Suffern, M.D.
 Major P. McK. Terry (T.F.).
 Temp. Capt. (Acting Major) J. A. W. Watts,
 M.B.
 Temp. Capt. A. G. Welsford, M.D., F.R.C.S.
 Temp. Capt. (Acting Lieut.-Col.) C. J. West,
 M.D.
 Temp. Capt. (Acting Major) W. A. Wheeldon,
 M.B.
 Major E. C. Whitehead, M.B.
 Temp. Major E. W. Witham.
 Temp. Capt. S. Wyborn.
 101253 Cpl. (Acting Staff-Serjt.) P. Abbatt.
 26592 Qmr.-Serjt. (Acting Serjt.-Major) H.
 Allen.
 78000 Pte. (Acting Serjt.) E. R. Andrews.
 18427 Serjt.-Major P. Barber.
 143137 Pte. A. E. Beales.
 442319 Serjt. (Acting Staff-Serjt.) F. Bongers
 (T.F.).
 58312 Serjt. H. Boyce.
 21442 Serjt. J. F. Brailsford.
 25429 Cpl. (Acting Serjt.) G. Brotherton.
 11734 Qmr.-Serjt. A. H. O. Campion.
 86920 Pte. (Acting Serjt.) H. Cane.
 33031 Pte. (Acting Staff-Serjt.) F. Carswell.
 22443 Serjt.-Major C. M. Clarke.
 465022 Staff-Serjt. E. R. Clements (T.F.).
 143140 Pte. W. C. Coit.

442240 Staff-Serjt. A. Davis (T.F.).
 15870 Cpl. (Acting Serjt.) V. Dennis.
 45223 Serjt.-Major T. J. Driscoll.
 27722 Serjt.-Major J. Eaves.
 46501 Serjt. R. J. Elworthy (T.F.).
 22460 Qmr.-Serjt. A. P. Evans.
 442064 Cpl. (Acting Serjt.-Major) J. W. Fields
 (T.F.).
 465002 Serjt. J. D. Griffiths (T.F.).
 28080 Pte. S. Heard.
 24126 Staff-Serjt. C. H. Hood.
 22493 Qmr.-Serjt. S. House (T.F.).
 56746 Cpl. W. R. Hutchinson.
 25889 Qmr.-Serjt. J. W. Johnson.
 442104 Serjt.-Major C. Jones (T.F.).
 102804 Cpl. (Acting Qmr.-Serjt.) E. A. Lougher.
 102471 Pte. (Acting Serjt.) W. F. Loveday.
 25736 Staff-Serjt. W. Mant.
 26426 Qmr.-Serjt. (Acting Serjt.-Major) W. F.
 Maynard.
 22523 Serjt.-Major A. Millington (T.F.).
 4650 Pte. G. Nelsey.
 83189 Pte. (Acting Serjt.) S. W. Ordish.
 34582 Serjt. W. H. Perry.
 442324 Serjt. L. Rawlings (T.F.).
 103072 Serjt. T. H. Richardson.
 26775 Qmr.-Serjt. F. W. Rittman.
 442024 Staff-Serjt. (Acting Qmr.-Serjt.) W. L.
 Sherwood (T.F.).
 101874 Pte. (Acting Serjt.) B. Sissons.
 125008 Pte. (Acting Serjt.) C. H. Small.
 100087 Qmr.-Serjt. (Acting Serjt.-Major) C.
 Spencer.
 461237 Cpl. E. S. Stedman.
 22942 Cpl. (Acting Staff-Serjt.) H. L. Steele.
 73935 Pte. L. Sullivan.
 442045 Serjt. (Acting Staff-Serjt.) J. Teasdale.
 442020 Qmr.-Serjt. C. J. Tidsall (T.F.).
 103101 Cpl. (Acting Serjt.) G. W. Tiller.
 101114 Cpl. (Acting Serjt.) T. Walton.
 78158 Pte. E. P. Watson.
 27500 Lance Cpl. T. H. Wigglesworth.
 444023 Staff-Serjt. (Acting Qmr.-Serjt.) A.
 Williams.
 22583 Serjt. B. C. Williamson (T.F.).
 87571 Pte. (Acting Qmr.-Serjt.) C. W.
 Wingham.
 442329 Serjt. (Acting Staff Serjt.) T. Wright
 (T.F.).
 25930 Serjt.-Major M. Wyld.
 103239 Pte. (Acting Serjt.) E. A. Wynn.

Western Command.

Army Medical Service.

Col. C. Averill, V.D., M.D. (T.F.).

| Col. W. Coates, C.B., V.D. (T.F.).

Royal Army Medical Corps.

Capt. (Acting Major) A. J. H. Boyton.
 Qmr. and Capt. E. Davies (T.F.).
 Qmr. and Major H. W. Glover.
 Temp. Col. E. Goodall, M.D., F.R.C.P.
 Lieut.-Col. J. H. P. Graham (S.R.) (Hon. Lt.
 Ind. Army).
 Lieut.-Col. and Hon. Surg.-Col. D. Hepburn,
 O.M.G., V.D., M.D. (T.F.).
 Capt. A. E. Hodgson (T.F.).
 Major H. T. Jenkins, 6th Batt. Royal Welsh
 Fusiliers (T.F.), (attached).

Capt. C. Lapage, M.D. (T.F.).
 Temp. Lieut.-Col. A. Lingard, M.B.
 Major R. W. Murray, F.R.C.S. (T.F.).
 Major F. T. Paul, F.R.C.S. (T.F.).
 Temp. Major F. M. Rogers, M.D.
 Temp. Lieut.-Col. A. Simpson, M.D.
 Capt. (Acting Major) J. Tait (T.F.).
 Qmr. and Capt. F. B. Wild (T.F.).
 Lieut.-Col. G. A. Wright (T.F.).

33rd Army Corps.

Royal Army Medical Corps.

Capt. (Acting Major) R. Armstrong, M.B. (T.F.).	47344 Qmr.-Serjt. (Temp. Warrant Officer,
Temp. Capt. A. Grant, M.B.	Class 2) F. G. Elsdon (T.F.).
Qmr. and Lieut. W. C. Griffiths.	318228 Qmr.-Serjt. J. Flanagan (T.F.).
Temp. Capt. S. B. Hanbury.	497482 Pte. (Acting Serjt.) T. H. Hill (T.F.).
Major H. A. Howes, T.D. (T.F.), Major 4th	495441 Cpl. (Acting Serjt.) E. S. How (T.F.).
Battalion Line Regiment (T.F.).	527597 Serjt. (Acting Staff-Serjt.) A. V. N.
Major S. R. Matthews (T.F.).	Jones (T.F.).
Major D. J. Penny, T.D., M.B. (T.F.).	554037 Pte. (Acting Serjt.) H. O. Newport (T.F.).
Capt. G. Raymond (T.F.).	554049 Serjt. A. E. Poplett, 334th Field
502012 Serjt. J. H. Anderson.	Ambulance (T.F.).
98942 Serjt.-Major J. W. Bilbey.	320399 Pte. A. Spence, 318th Field Ambulance
99208 Serjt. E. C. Bridge.	(T.F.).

*Irish Command.**Royal Army Medical Corps.*

Temp. Qmr. and Capt. T. Allen.	Temp. Capt. R. H. Scovell, M.B.
Capt. O. H. Blacklay, M.D. (T.F.).	Lieut.-Col. B. W. Somerville-Large, F.R.C.S.
Lieut.-Col. J. E. Buchanan, M.C., Reserve	Edin.
of Officers.	Major E. T. Vint, M.B. (T.F.).
Lieut.-Col. G. J. Coates, M.D.	Temp. Capt. H. R. Wright.
Temp. Capt. I. A. Davidson, M.D.	26067 Staff-Serjt. W. Arnold.
Lieut.-Col. H. C. Donald, M.B., T.D. (T.F.).	86262 Pte. C. D. Brown.
Temp. Capt. (Acting Lance-Col.) J. D. O'D.	91639 Pte. (Acting Cpl.) A. T. Finch.
Egan.	22630 Pte. J. Flood.
Temp. Capt. B. Ferrar, M.D.	104925 Staff-Serjt. H. V. Garnham.
Temp. Capt. R. B. Hunt.	127134 Pte. H. Gray.
Temp. Major R. D'A. Irvine, M.B.	9636 Serjt.-Major D. W. Greenwood.
Lieut.-Col. H. Jones (T.F.).	28365 Cpl. (Acting Serjt.) H. W. Grundy.
Temp. Capt. T. Kirkwood, M.B.	31891 Staff-Serjt. W. Hughes.
Temp. Capt. H. S. Laird.	41030 Staff-Serjt. C. Kemp.
Temp. Capt. (Acting Major) W. Law, M.D.,	9658 Cpl. T. Lewis.
F.R.C.S.I.	67739 Cpl. (Acting Serjt.) H. L. Marion.
Temp. Major A. K. MacDonald, Special List,	91226 Pte. W. T. Nobbs.
attached.	500247 Pte. (Acting Cpl.) F. Ovenden.
Temp. Capt. (Acting Major) D. Murphy, M.B.	26544 Cpl. (Acting Qmr.-Serjt.) C. H. Sackville.
Lieut.-Col. J. P. J. Murphy, M.B.	104064 Pte. (Acting Cpl.) J. Wainwright.
Temp. Qmr. and Capt. F. G. Oldham.	26583 Staff-Serjt. R. Whittaker.
Temp. Capt. N. C. Patrick.	28285 Serjt. (Acting Qmr.-Serjt.) J. R.
Temp. Capt. C. B. Pearson, M.B.	Woodroffe.
Lieut.-Col. A. de C. Scanlan, C.M.G.	

MISCELLANEOUS.

Royal Army Medical Corps.

Capt. and Brevet Major C. W. Wirgman, M.D., F.R.C.S. (T.F.).

MINISTRY OF MUNITIONS.

Royal Army Medical Corps.

Capt. J. M. McQueen (T.F.).

| Temp. Hon. Capt. C. G. Wolf, L.

BERMUDA.

Royal Army Medical Corps.

5260 Serjt. A. J. Bow.

CEYLON.

Royal Army Medical Corps.

Capt. (Acting Major) P. W. Matthew (Special Reserve).

| 1837 Serjt. (Acting Serjt.-Major) C. Hopkins.

EGYPT.

Royal Army Medical Corps.

Lieut.-Col. (Acting Col.) C. Garner, C.B.E., M.B. (retired pay).

GIBRALTAR.

Royal Army Medical Corps.

Temp. Capt. W. O. Roberts.
18331 Cpl. (Acting Serjt.) H. Waters, 28th
Company.

| 29175 Pte. J. G. Williams, 30th Company.

HONG KONG.*Royal Army Medical Corps.***Lieut.-Col. G. B. Crisp.****JAMAICA.***Royal Army Medical Corps.***Major R. S. Turton.**

| 83760 Cpl. G. C. Crummack.

MALTA.*Royal Army Medical Corps.***Temp. Major T. Mackenzie, V.D., M.D.**

| 12466 Staff Serjt. (Acting Serjt.-Major) W.

Temp. Major C. R. Nicholson.

| Grogan.

17390 Staff Serjt. (Acting Serjt.-Major) R.

| 53243 Serjt. (Acting Serjt.-Major) W. King.

Cowx.*Royal Malta Artillery.***Surg.-Major A. E. Mifsud.**

| Surg.-Major R. Randon, M.D.

ARMY MEDICAL SERVICE.

Lieut.-Col. Cathcart Garner, C.B.E., M.B., retired, is granted the rank of Colonel on ceasing to be re-employed, dated November 24, 1918.

Major William M. Power, from the half-pay list, retires on retired pay, dated October 5, 1919.

Col. John S. Davidson, M.B., retires on retired pay, dated October 1, 1919.

ROYAL ARMY MEDICAL CORPS.

The undermentioned relinquish the acting rank of Lieutenant-Colonel:—

Capt. C. H. Stringer, D.S.O., on ceasing to command a medical unit, dated May 1, 1919.

Capt. Arthur W. Raymond, M.C., M.B., resigns his commission, dated October 4, 1919.

The undermentioned to be acting Lieutenant-Colonel whilst specially employed:—

Major and Brevet Lieut.-Col. Andrew McMunn, O.B.E., dated June 6 to September 8, 1919.

The undermentioned relinquishes the acting rank of Major on ceasing to be specially employed:—

Capt. and Brevet Major James D. Kidd, O.B.E., M.C., M.B., dated September 1, 1919.

The undermentioned to be Acting Majors whilst specially employed:—

Dated August 19, 1919.—**Capt. Charles D. K. Seaver.**

Dated September 1, 1919.—**Capt. Arthur L. Foster.**

The undermentioned Captains, from Special Reserve, to be Captains:—

Dated February 16, 1918.—**Kenneth Alexander Maclean, M.B.,** but not to reckon for pay or allowances prior to September 1, 1919, with precedence next below E. G. Foley.

Dated March 30, 1918.—**Charles Layton Balkwill,** but not to reckon for pay or allowances prior to September 1, 1919, with precedence next below W. H. Cornelius.

Dated April 30, 1918.—**Capt. Henry Alcock, M.B.,** from Special Reserve, but not to reckon for pay or allowances prior to September 1, 1919, with precedence next below Q. V. B. Wallace.

The undermentioned Captains, from Special Reserve, to be Captains:—

Dated March 23, 1918.—**Robert Ringrose Gelston Atkins, M.C., M.B.,** but not to reckon for pay or allowances prior to September 1, 1919, with precedence next below F. S. Gillespie.

Dated May 9, 1918.—**John Stevenson, M.C.,** but not to reckon for pay or allowances prior to September 1, 1919, with precedence next below B. McKelvey.

The notification in the *Gazette* of June 27, 1919, regarding Major Gerald F. Rudkin, D.S.O., is cancelled.

Major Gerald F. Rudkin, D.S.O., relinquishes the acting rank of Lieutenant-Colonel on ceasing to command a medical unit, dated August 5, 1919.

Capt. Phillip Carney, M.C., M.B., relinquishes the acting rank of Major on re-posting, dated June 7, 1919.

Capt. John Sainsbury, M.B., resigns his commission, dated October 9, 1919.

Capt. Clifford William Sparks, M.C., from Special Reserve, to be Captain, dated February 20, 1918, but not to reckon for pay or allowances prior to September 1, 1919, with precedence next below S. Smith.

Major Winfred K. Beaman, D.S.O., relinquishes the acting rank of Lieutenant-Colonel on ceasing to command a medical unit, dated March 28, 1919.

Major Thomas H. Scott, D.S.O., M.C., M.B., relinquishes the acting rank of Lieutenant-Colonel on ceasing to command a medical unit, dated September 21, 1919.

Capt. Lionel Beale Clarke, from Territorial Force, to be Captain, dated November 26, 1918, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below L. A. J. Graham.

Major (Acting Lieutenant-Colonel) Patrick Dwyer, M.C., relinquishes the acting rank of Lieutenant-Colonel, dated June 2, 1919.

The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel :—

Dated April 1, 1919.—William P. Gwynn, C.M.G.

Dated April 19, 1919.—James H. R. Bond, D.S.O.

Lieut.-Col. Harold Simson, O.B.E., relinquishes the acting rank of Colonel, dated May 10, 1919.

Major and Brevet Lieut.-Col. Alexander W. Sampey relinquishes the acting rank of Lieutenant-Colonel, dated May 20, 1919. (Substituted for the notification in the *Gazette* of September 18, 1919.)

The undermentioned relinquish the acting rank of Lieutenant-Colonel :—

Dated April 13, 1919.—Capt. Joseph H. Ward, D.S.O., M.C., M.B.

Dated May 2, 1919.—Capt. Arthur H. T. Davis on ceasing to command a medical unit.

Dated August 10, 1919.—Major Hugh G. Sherren.

Dated August 27, 1919.—Major Augustus S. Williams, D.S.O.

Dated August 29, 1919.—Major William MacD. MacDowall.

Dated September 25, 1919.—Capt. Guy O. Chambers, M.C.

The undermentioned to be acting Lieutenant-Colonels :—

Dated October 24, 1915, to June 25, 1916.—Capt. Allan Watson, D.S.O., M.D., whilst commanding a medical unit.

Dated April 26, 1919.—Capt. Joseph R. Hill, M.B.

Dated June 21, 1919.—Major Thomas H. Scott, D.S.O., M.C., M.B.

Dated July 15, 1919.—Capt. Philip Carnev, M.C., M.B.

Dated July 28, 1919.—Capt. Augustus J. Hickey, M.C.

The notification in the *Gazette* of June 27, 1919, regarding Capt. Henry C. D. Rankin, M.B., is cancelled.

The undermentioned Captains relinquish the acting rank of Major :—

Dated February 24, 1919.—Alexander L. Stevenson, M.B.

Dated April 19, 1918.—Phillip G. M. Elvery, D.S.O., M.C.

Dated May 19, 1918.—Frank S. Tamplin.

Dated September 22, 1919.—Brevet Major John D. Bowie, D.S.O., M.B.

The undermentioned Captains to be acting Majors :—

Dated February 26, to March 27, 1919.—Frank S. Tamplin.

Dated July 28, 1919.—Brevet Major John D. Bowie, D.S.O., M.B.

Dated August 3, 1919.—Francis R. H. Mollan, M.C.

The undermentioned Temporary Captains to be Acting Majors :—

Dated November 20, 1918.—Robert B. Wallace, D.S.O., M.C., M.B.

Dated January 6 to April 11, 1919.—Horace W. Hay.

Dated February 1, 1919.—Stephen H. Pitcairn.

Dated March 14, 1919.—Octavius de Burgh, O.B.E., M.B.

Dated June 21, 1919.—William B. Swete-Evans, M.D.; Arthur W. Comber; Walter S. Perrin, F.R.C.S.; Francis D. Saner, M.B., F.R.C.S.; Alexander C. Lambert, M.C., M.D.; Frank D. Johnson; Arthur G. Howson, M.B.; Albert A. Wilson, M.D.

Dated June 21 to August 17, 1919.—Cornelius A. O'Driscoll.

Dated June 21 to August 22, 1919.—Alfred A. W. Petrie, M.D., F.R.C.S. Edin.

Dated July 1, 1919.—John W. Simon.

Dated July 28, 1919.—Alexander R. Esler.

The notification in the *Gazette* of May 16, 1919, regarding Capt. Cedric O. Shackleton, M.B., is cancelled.

Capt. Alexander L. Aymar, M.B., relinquishes the acting rank of Major, dated February 23, 1919.

Capt. Alexander L. Aymar, M.B., to be acting Major, dated March 15, 1919.

Major George W. Heron, D.S.O., O.B.E., is restored to the establishment, dated April 1, 1919.

CAMBRIDGE HOSPITAL CHALLENGE CUP.

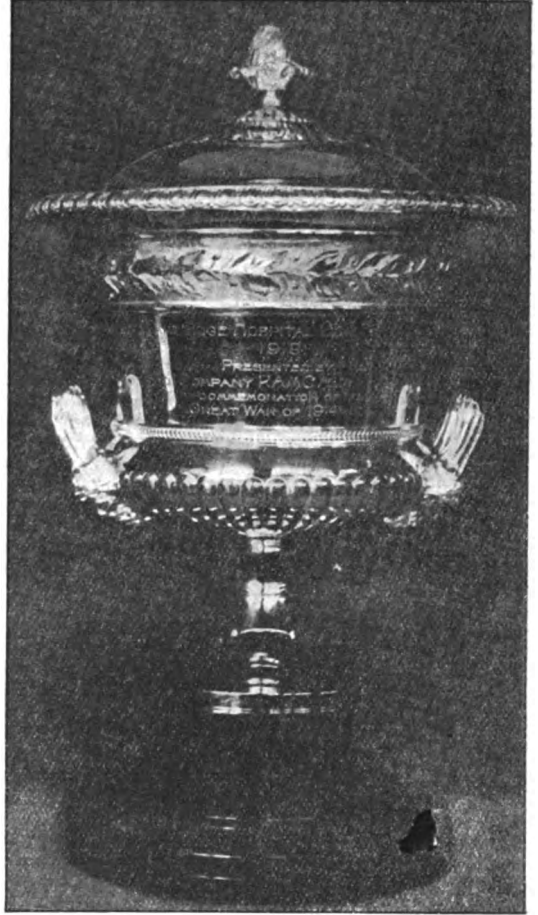
No. 1 Company Royal Army Medical Corps has presented a Challenge Cup to be competed for annually by Company teams in the Tug-of-War at the Royal Army Medical Corps Aldershot Command Annual Sports. The competition is open to all Royal Army Medical Corps Companies.

A replica or other token will be presented to the Captain and each member of the winning team.

The cup to be held for one year by the winning Company and will be kept in the Recreation Room or Serjeants' Mess at the discretion of the officer commanding the Company. If it is not desired to keep it in the Recreation Room or if there is no Serjeants' Mess it will be kept in the Serjeants' Mess of No. 1 Company.

The first competition was held this year and only Aldershot Companies entered. "B" Company won—No. 1 Company was second. The Cup as the photograph shows is a very beautiful one. It has been handed over to "B" Company.

Staff-Serjt. J. E. Banks, R.A.M.C., prepared the photographs. The Goldsmiths and Silversmiths Company supplied the cup, the dimensions of which are: height fourteen inches without the plinth, width ten inches.



ROYAL ARMY MEDICAL CORPS CENTRAL MESS FUND.

SUMMARY OF THE PROCEEDINGS OF A MEETING OF THE COMMITTEE HELD AT THE ROYAL ARMY MEDICAL COLLEGE ON SEPTEMBER 8, 1919.

Present :—

Brevet Lieut.-Col. P. S. Davidson, C.M.G., D.S.O., representing Aldershot Division, in the Chair.

Major F. A. Stephens, D.S.O., representing Netley Mess.

Major G. G. Tabuteau, D.S.O., representing Woolwich Mess.

Brevet Lieut.-Col. W. Benson, D.S.O., representing Rawal Pindi Mess.

Major T. S. Blackwell, representing Aldershot Mess.

Major D. B. McGrigor, representing Northern Command.

Major S. G. Walker, representing Irish Command.

Capt. C. M. Rigby, representing London Mess.

Capt. L. Murphy, D.S.O., representing Southern Command.

Brevet Major T. A. Weston, representing Cosham Mess.

Capt. J. E. Hepper, representing London District.

Capt. J. Milner Adams, representing Curragh Mess.

(1) On the proposal of Major F. A. Stephens, seconded by Lieut.-Col. Benson, Lieut.-Col. P. Davidson, C.M.G., D.S.O., was unanimously elected Chairman in the place of Lieut.-Col. F. S. Irvine, C.M.G., D.S.O., resigned.

(2) The Minutes of the Meeting of May 2, 1919, were read and confirmed.

(3) Requests for grants and loans to make good the wear and tear of the war period were submitted by various messes. As a preliminary it was resolved that where a Mess shows large invested funds, it should draw on these investments before it comes to the Central Fund for help, unless it can show good reason why such procedure is financially unsound.

The *Aldershot* Mess asked for a grant of £125, and that the grant of £60 per annum made during the past two years towards maintenance be renewed. The furniture, which is the property of the Mess and not of the Government, and must therefore be kept up by the former, needs much repair. A sum of £250 had been voted for this purpose by the Mess, which would have to be found by the sale of investments, but a much larger sum would eventually be needed. Resolved unanimously that a grant of £125 be made, but that the question of the renewal of the maintenance allowance be suspended till the next meeting.

Cosham Mess asked for £50 to repair war damages. This Mess has no invested funds, and has received nothing from the Central Fund since the formation of the latter. Unanimously resolved that a grant of £50 be made.

The *London* Mess submitted its requests under three heads: (a) A detailed statement was laid before the Committee showing that the extraordinary expenditure which would be incurred on re-opening the Mess would amount to £300. Of this the largest item was £175 for the renovation of plate and silver, which was stated to be absolutely essential. The cleaning and renovation of big game trophies came to £25, and there were sundry other charges for repair of carpets, clocks, utensils, etc. Resolved unanimously that a grant of £300 be made.

(b) This mess also asked for help towards the renovation of all its oil paintings, which was stated to be very necessary, and the approximate cost of which was put at £175. Towards this it was suggested that both the Central Mess Fund and the Memorial Branch of the Royal Army Medical Corps Fund might be willing to contribute.

It was resolved unanimously that this question be suspended till the next meeting and that the Hon. Sec. of the mess be asked to report then the amount of any grant which the Memorial Branch of the Royal Army Medical Corps Fund might make for this purpose, the amount needed to complete the payment, and also how many of the oil paintings concerned came under the head of "memorials."

(c) A loan of £336 was requested towards the provision of carpets for officers' rooms. In previous times members of the mess hired these individually from a local firm, but it was thought better that the mess should carpet the seventy living rooms (forty had already been done) and recover the expenditure eventually by charging hire to the occupants. The total outlay would amount to £535, of which £168 has been paid to the Army and Navy Co-operative Society. Resolved unanimously that a loan of £300 be made for this purpose to the Committee of the *London* mess, on the understanding that they guarantee repayment of this sum, without interest, within six years from this date, by annual instalments of not less than £50 a year.

The Hon. Sec. of the *Netley* mess stated that the furniture, carpets, napery and crockery of this mess, all of which were its own property, were in a very bad condition and submitted an estimate showing that £250 would be needed to put them in good order, and also a balance sheet showing that its margin of assets over liabilities was small, its only investment being to the amount of £55.

Resolved unanimously that a grant of £250 be made to the *Netley* mess for the purpose stated. The Hon. Sec. read letters from *Woolwich* and the *Curragh* messes saying that they were not

making any call on the fund at present. He added that there had been no requests, as yet, from the messes in India, but that such are not unlikely to be made later.

Before passing to the next question it was unanimously resolved that, in future, any requests for help from this fund must be accompanied by a sufficiently detailed balance sheet showing the present position of the mess making the request, together with a statement of accounts for the last twelve months, showing separately Catering Fund, Mess Fund and Sundry Funds; and also the amounts paid by members daily for catering and subscriptions.

The Meeting authorized the sale of the necessary Bonds, at the discretion of the Chairman, should the above expenditure reduce the current credit balance below the level required by the Bankers.

(4) As it is a function of this Committee to further the interests of the Corps in representative games (though it has no authority to spend any money on this object) it was unanimously resolved that a sub-committee be formed to deal with any such question which may be submitted to it, and that the sub-committee be composed of the Chairman of the General Committee, Major F. A. Stephens, Major T. S. Blackwell and Captain C. M. Rigby, with power to co-opt any officers of the Corps specially qualified in the matter under consideration.

(5) The Hon. Sec. submitted vouchers for petty cash expended by him in printing, typing, postage, etc., since February last, amounting to £5 11s. 3d., refund of which sum to him was sanctioned.

(6) A draft of a notice to be sent to all officers appointed to the Corps was submitted and it was resolved that, after this had been amended at the discretion of the Chairman, the Hon. Sec. be authorized to have it printed and sent out.

(7) Referring to the silver and plate placed at the disposal of the Central Mess Committee by the members of the late Royal Army Medical Corps mess at Roberts' Heights, Pretoria, the Hon. Sec. reported that several cups, etc., had been given by various officers to the mess, and asked whether the Committee wished to ascertain the wishes of the original donors before deciding to what messes they should be allotted. Resolved that this be done.

3, Homefield Road,
Wimbledon, S.W.19.

J. T. CLAPHAM,
Captain,
Hon. Secretary.

ROYAL ARMY MEDICAL CORPS FUND.

PROCEEDINGS OF A COMMITTEE MEETING HELD AT CORNWALL HOUSE, STAMFORD STREET,
WAR OFFICE, ON OCTOBER 9, 1919.

Present.

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General,
in the Chair.

Major Gen. Sir G. B. Stanistreet, K.B.E., C.B., C.M.G., Deputy Director-General.

Major Gen. Sir W. Donovan, K.C.B.

Major Gen. S. G. Moores, C.B., C.M.G.

Col. Sir J. Magill, K.C.B.

Col. C. R. Tyrrell, C.B., C.B.E.

Major P. G. Easton, C.B.E., D.S.O.

Major E. P. Offord.

Captain E. B. Allnutt, M.C., Band President.

(1) The minutes of the previous meeting held on July 17, were read and confirmed.

(2) *Officers' Branch.*—Memorials. (i) The Secretary reported the receipt of the special portrait of Sir A. Keogh at the Royal Army Medical Corps Mess, Grosvenor Road. (ii) Also action taken regarding the application of the sculptor who has designed the Memorial for distinguished officers, for payment of a portion of the amount agreed upon. It was explained that the design is now in the hands of the bronze founders, and it was hoped would shortly be completed.

(3) The payment of £100 already made on account was approved and it was decided that a further payment of £100 should be made at once.

(4) *Band.*—The Band President explained the present position of the finances and it was proposed by Col. C. R. Tyrrell and seconded by Major Easton that a grant of £100 should be made.—Carried.

It was also decided that certain questions relating to small advances in salaries were matters for local decision and could be settled by the Band Committee.

(5) The Director-General gave some particulars relating to the case of the widow and orphan of the late W. C. which had been brought to his notice, and after discussion it was proposed by Sir J. Magill and seconded by Major Gen. Guise Moores, that the Secretary be instructed to

make full inquiries and submit to the Director-General. In the event of the inquiries being satisfactory a grant not exceeding £30 should be approved. Also that it should be made clear that any such grant was a gift from the Fund and had no connection with any application for an increase of pension.

(6) The Commandant of the Royal Army Medical College brought forward an application for a grant in aid of the expenses connected with the cleaning and restoration of pictures in the Royal Army Medical Corps Mess at Grosvenor Road representing former Director-Generals and other officers of the Corps. The question was fully discussed and it was proposed by Col. Sir J. Magill and seconded by Major-Gen. Sir W. Donovan that a grant of £114 14s. 6d. be made to the Royal Army Medical Corps Mess at Grosvenor Road for the restoration of pictures of officers connected with the Corps. This grant to be considered as a special case owing to the unusual conditions resulting from the war. This was carried.

(7) A letter was read from Lieut.-Gen. Sir W. Babbie recommending the purchase of a copy of the "Roll of the Corps," by the late Col. W. Johnston, C.B., at a cost of £1 1s., as likely to be most useful in obtaining information both for this Fund and the Royal Army Medical Corps Benevolent Society.—Approved.

(8) *General Relief.*—(i) The Secretary reported action taken in the case of Mrs. L. E. S. who had applied for admission into the Whiteley Homes and also had now withdrawn her application. (ii) Also certain small grants which had been made under Rule 9 in urgent cases amounting to £37.—Action approved.

(9) Appeals for assistance under Rule 8 were submitted and the following grants authorized.

The wife and children of F. F. O.	..	..	..	£3	0	0
The widow and children of D. L.	..	..	..	3	0	0
" " " A. G. T.	..	..	..	3	0	0
" " " J. H. L. O.	..	..	..	3	0	0
Mr. W. F. C. and wife, old age and insufficient means	..	..	..	6	0	0
Total	..	..	..	£18	0	0

(10) The following donations have been received since the last meeting, to £330 10s. 10d.

26th Casualty Clearing Station	..	..	..	£12	3	0
5th and 100th Field Ambulance	..	..	..	27	0	0
12th Stationary Hospital	..	..	..	12	0	0
12th Field Ambulance	..	..	..	4	3	0
5th Field Ambulance	..	..	..	7	5	7
136th Field Ambulance	..	..	..	10	0	0
39th General Hospital	..	..	..	13	8	8
62nd Casualty Clearing Station	..	..	..	13	17	9
5th and 6th Field Ambulance	..	..	..	18	0	0
39th General Hospital	..	..	..	48	10	6
Royal Army Medical Corps Depot, Deolali	..	..	..	68	15	0
106th Field Ambulance	..	..	..	46	12	10
2nd General Hospital	..	..	..	18	8	2
18th Field Ambulance	..	..	..	16	3	0
Regimental Institutes 104th Field Ambulance	..	..	..	14	3	4
Total	..	..	..	£330	10	10

(11) The Secretary reported that the present cash balance in this Branch amounted to £1,005 15s. 1d. and it was decided to invest a further amount of £600 in Government Securities after consultation with Messrs. Holt and Co.

ROYAL ARMY MEDICAL CORPS OFFICERS' BENEVOLENT SOCIETY.

MINUTES OF A MEETING HELD AT CORNWALL HOUSE, STAMFORD STREET, WAR OFFICE,
ON OCTOBER 9, 1919.

Present.

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General
in the Chair.

Major-Gen. Sir W. Donovan, K.C.B., one of the Trustees.

Major-Gen. Sir H. R. Whitehead, K.C.B.

Major-Gen. Sir M. W. Russell, K.C.M.G., C.B.

Col. A. Peterkin, C.B.

Col. H. W. Murray.

Capt. J. T. Clapham.

- (1) The minutes of the previous meeting held on July 17 were read and confirmed.
- (2) The Secretary reported receipt of very grateful letters of thanks from the recipients of the additional grants voted at the last meeting—and also action taken in the matter of certain orphans whose cases were submitted for increase of compassionate allowance.
- (3) Two grants which had been made under Rule 31 for specially urgent cases were reported and approved.
- (4) A grant of £15 for the orphan son of the late H. C. T. was approved.
- (5) It was decided to send a special appeal to all officers who are non-subscribers on the occasion of the completion of the Centenary of the Fund.

WAR OFFICE ENTOMOLOGICAL LABORATORY.

Major J. E. M. Boyd, R.A.M.C., War Office Entomological Laboratory, Kitchener Camp, Richborough, Sandwich, Kent, would be much obliged, if officers of the Royal Army Medical Corps, especially those serving abroad, would forward to him any fleas, bugs, ticks, or other insects of medical entomological interest, as they are required for research work and also to help towards forming a representative collection at the laboratory.

Fleas, bugs, and ticks may be dropped alive into seventy per cent alcohol and forwarded either in tubes or bottles.

Short notes as to the host on which they were found, and the locality and date would prove of interest.

*Sandwich,
October 14, 1919.*

ROYAL ARMY MEDICAL CORPS OFFICERS' MESS.

WE have received the following letter from the President of the Committee of the Royal Army Medical Corps Officers' Mess, London :—

Grosvenor Road,
London, S.W. 1.
September 29, 1919.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

DEAR SIR,—A piece of Plate representing a Stretcher Party has been forwarded to this Mess by Brevet Colonel A. H. Safford, R.A.M.C. This was subscribed for by Colonel Safford and the Officers Royal Army Medical Corps Training Centre, Crookham, September 7, 1914, to March 7, 1917.

A letter of thanks has been forwarded to Colonel Safford in India and in the meantime I should be obliged if you would publish this letter as a very grateful acknowledgment from the Mess Committee to those Officers who so generously subscribed to this handsome gift.

I remain,

Yours truly,

S. GUISE MOORES, *Major General,*
President, Mess Committee.

ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND.

SUMMARY OF PROCEEDINGS OF A QUARTERLY MEETING OF THE COMMITTEE WHICH WAS HELD
AT THE ROYAL ARMY MEDICAL COLLEGE ON OCTOBER 27, 1919.

Present.

Deputy Surg.-Gen. W. G. Don, President, in the Chair.

Lieut.-Gen. Sir W. L. Gubbins, K.C.B., M.V.O.

Major-Gen. W. S. M. Price.

Major-Gen. Sir G. D. Bourke, K.C.M.G., C.B.

Major-Gen. S. Guise Moores, C.B., C.M.G.

Col. Sir R. H. Firth, K.B.E., C.B.

Lieut.-Col. J. F. Martin, C.M.G., C.B.E.

Major A. C. H. Gray, O.B.E.

A letter was read from Col. W. R. P. Goodwin, D.S.O., regretting his inability to be present.

- (1) The Minutes of the previous meeting were read and confirmed.

(2) Major V. T. Carruthers was admitted as a married, and Capt. C. M. Rigby as an unmarried member.

The admission of Capt. A. B. Preston, M.C., as a married member was confirmed, his papers having been received.

Major W. Egan and Capt. A. S. Heale, M.C., were admitted as provisional married members, their subscriptions having been paid, but their papers being not yet complete.

(3) Payment of annuities for the current half year was sanctioned.

(4) The purchase of £4,000 four per cent Funding Loan, 1960-1990, at a cost of £3,200 as authorized at the previous meeting, was reported.

(5) In view of the £3,100 half-yearly interest on £124,000 five per cent War Stock, due on December 1 next, the investment of cash surplus at that date was considered. The Secretary reported that there would probably be about £2,500 available, but that the exact sum depended on possible calls on the Fund for payments at death. After consideration of various investments it was unanimously resolved that, subject to the approval of the Trustees, the cash surplus available about December 1 be invested in such securities, guaranteed by the British Government, as may at that time be considered most desirable by Sir James McGrigor and the Actuary—such as the four per cent Funding Loan, 1916-90; the five per cent War Loan, 1929-47, or the five per cent National War Bonds, with a leaning towards the long dated Funding Loan, if other things be equal. The Committee considered the new five per cent Sudan Loan, but were not in favour of it. The Secretary was empowered to take the necessary action.

(6) Payment was sanctioned of the Secretary's salary, and office allowance for the quarter ended September 30, and also refund of petty cash expended by him.

3, Homefield Road,
Wimbledon, S.W. 19.

J. T. CLAPHAM, Captain,
Secretary.

ROYAL ARMY MEDICAL COLLEGE.

LIST OF BOOKS ADDED TO THE LIBRARY DURING THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1919.

Title of Work and Author	Edition	Date	How obtained
<i>The Medical Annual</i>		1919	Library Grant.
The Principles and Practice of Medicine. By Osler and McGrae	8th	1919	" "
Anoxi Association. By Crile and Lower		1915	" "
Injuries to the Head and Neck. By H. Lawson Whale, M.D.		1919	" "
Diet in Health and Disease. By Friedenwald and Ruhrah	5th	1919	" "
Beverages and their Adulteration. By Harvey W. Wiley, M.D.		1919	" "
Cerebro-spinal Fever. By Wilson-Drought and Kennedy		1919	" "
A Text-Book of Physiology. By Martin Flack and Leonard Hill		1919	" "
A System of Clinical Medicine. By T. D. Savill, M.D.	5th	1919	" "
The After-treatment of Wounds and Injuries. By R. C. Elmslie, M.S., F.R.C.S.		1919	" "
Vicious Circles in Disease. By Jamieson B. Hurry, M.A., M.D.	3rd	1919	" "
Diseases of Women. By Ten Teachers. Under the Direction of Comyns Berkeley, M.D.		1919	" "
Roentgen Diagnosis of Diseases of the Head. By Dr. Arthur Schüller. Translated by Fred F. Stocking, M.D.		1919	" "
A School Algebra. By H. S. Hall		1919	" "
Elementary Mensuration. By F. H. Stevens, M.A. ..		1919	" "
The Cost of Food, A Study in Dietaries. By Ellen H Richards and John F. Norton	3rd	1917	" "

LIST OF BOOKS ADDED TO THE LIBRARY—Continued.

Title of Work and Author	Edition	Date	How obtained
Animal Parasites and Human Disease. By Asa C. Chandler, M.S.		1918	Library Grant.
<i>The Bio-Chemical Journal</i> . Vol. xiii, Nos. 1 and 2, May and July		1919	" "
A Manual of Chemistry. By Luff and Candy	6th	1919	" "
The Story of English Public Health. By Sir Malcolm Morris, K.C.V.O.		1919	" "
Infant and Young Child Welfare. By Harold Scurfield, M.D.		1919	" "
Food and the Public Health. By W. G. Savage, M.D.		1919	" "
The Welfare of the Expectant Mother. By Mary Scharlieb, C.B.E., M.D.		1919	" "
A Manual of Physics for Medical Students. By Hugh C. H. Candy	2nd	1918	" "
The Nervous Heart, its Nature, Causation, Prognosis and Treatment. By Capt. R. M. Wilson, R.A.M.C., and Major John H. Carroll, M.C., U.S.A.		1919	" "
Psychoses of the War. By H. C. Marr, M.D.		1919	" "
The Early Treatment of War Wounds. By Col. H. M. W. Gray, C.B., C.M.G., A.M.S.		1919	" "
Manual of Bacteriology. By Muir and Ritchie	7th	1919	" "
Fevers in the Tropics. By Sir Leonard Rogers, Kt., C.I.E.	3rd	1919	" "
<i>Journal of the Royal Agricultural Society of England</i> . Vol. lxxix		1918	" "
1914. By Field-Marshal Viscount French of Ypres, K.P., O.M., etc.		1919	" "
With the Grand Fleet 1914—1916, its Creation, Development and Work. By Admiral Viscount Jellicoe, G.C.B., O.M., etc.		1919	" "
Peace and its Foundations. By C. J. Dickenson.. ..		1919	" "
Baghdad Sanitary and Development Committee. Précis of Minutes of Proceedings from its Formation in July, 1917, to December, 1918		1919	Editor, Journal.
Catalogue of Lewis's Medical and Scientific Circulating Library		1918	" "
Egyptian Government. Preliminary Report of the Antimalarial Commission		1919	" "
The Medical and Surgical Aspects of Aviation. By H. Graeme Anderson, M.B., Ch.B., F.R.C.S.		1919	" "
Aids to Surgery. By Joseph Cuning and Cecil A. Joll ..	4th	1919	" "
Elements of Surgical Diagnosis. By Sir A. Pearce Gould and Eric Pearce Gould	5th	1919	" "
Technique of the Irrigation Treatment of Wounds by the Carrel Method. By J. Dumas and Anne Carrel. Translated by Adrian V. S. Lambert		1918	" "
Practical Notes on Courts of Inquiry, Committees and Boards. By W. F. Cox		1919	" "
Fractured Femurs, their Treatment by Calliper Extension. By Pearson and Drummond		1919	" "
The Urethroscope in the Diagnosis and Treatment of Urethritis. By Major N. P. Lumb, O.B.E., R.A.M.C.		1919	" "
National Health Insurance. Medical Research Committee. Special Report Series :—		1919	" "
No. 32.—The Science of Ventilation and Open-air Treatment, Part I		1919	" "
No. 27. Reports of the Special Investigation Committee on Surgical Shock and Allied Conditions. Blood Volume Changes in Wound, Shock, and Primary Hemorrhage		1919	Medical Research Committee.
Wiederherstellungs-Chirurgie. Von Prof. Dr. Erich Lexer		1919	War Office.

LIST OF BOOKS ADDED TO THE LIBRARY—Continued.

Title of Work and Author	Edition	Date	How obtained
Fourth Plenary Session of the Sanitary Conference of the Allied Powers held in Paris, March, 1919		1919	War Office.
<i>Journal of the Royal Naval Medical Service</i> , July, 1919		1919	The Editor.
London County Council. Report of the County Medical Officer of Health and School Medical Officer for the year 1918		1919	Clerk of the Council
Report of the Chemical Examiner to Government :—			
Punjab, for the year 1918.		1919	India Office
North-West Province, for the year 1918		1919	" "
Report of the Jail Administration of the Province of Assam, for the year 1918. By the Hon. Col. J. Garvie, I.M.S.		1919	" "
Annual Sanitary Report of the Province of Assam, for the year 1918. By Major T. C. McCombie Young, I.M.S.		1919	" "
Report on the Sanitary Administration of the Punjab and Proceedings of the Sanitary Board, for the year 1918. By Lieut.-Col. W. H. C. Forster, I.M.S.		1919	" "
Report of the Administration of the Jails in the Punjab, 1918			Chief Secretary to Govt. Punjab.
Notes on Vaccination in the Punjab for the year 1918-19. By Lieut.-Col. W. H. C. Forster, I.M.S.			" "
Notes on Vaccination in the United Provinces of Agra and Oudh, for the year ending March 31, 1918. By the Hon. C. MacTaggart, C.I.E., I.M.S.		1918	Govt. Press United Provinces.
The Fauna of British India. Series: Coleoptera, Chrysomelidæ (Hispidæ and Cassidinæ). By S. Manlik		1919	Secretary of State for India
<i>The Japan Medical World</i> , May 18 to August 17, 1919..		1919	The Director.
<i>The Medical Officer</i> , July 5 to September 27		1919	The Editor.
Trench Fever, a Louse-borne Disease. By Major W. Byam, R.A.M.C., and others		1919	Presented by the Authors per Major W. Byam.
The Risings on the North-West Frontier, 1897-1898 . .		1898	Presented by Lieut.-Col. P. S. Lslean, C.B., R.A.M.C.
<i>The Geographical Journal</i> , June, July, August and September, 1919		1919	Presented by Col. R. J. S. Simpson, C.B., C.M.G., A.M.S.

MARRIAGE.

HAMERTON—MILLER.—On September 17, at St. Peter's Church, St. Leonards-on-Sea, by the Rev. T. J. Hamerton, father of the bridegroom, Lieut.-Col. Albert Ernest Hamerton, C.M.G., D.S.O., Royal Army Medical Corps, to Amelia, widow of Morris Miller.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

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	8	0 6 0	0 2 9				
	16	0 10 6	0 5 0				
50	4	0 4 6	0 1 10	6 0	2 1	4 10	1 2
	8	0 7 6	0 3 6				
	16	0 13 3	0 5 10				
100	4	0 6 0	0 3 1	7 10	3 11	6 7	2 5
	8	0 10 0	0 4 10				
	16	0 18 6	0 7 6				
200	4	0 9 6	0 4 5	10 10	7 6	9 0	4 10
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Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are

inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 56, Cornwall House, Stamford Street, S.E.1.

Communications have been received from the following: Major-Gen. H. N. Thompson; Lieut.-Cols. J. C. Kennedy, R. Muir; W. J. B. Scroggie (I.M.S.); H. W. Spaight, J. F. Mayne; H. Compton, Esq.; Serjt. W. R. Jackson.

The following publications have been received:—

British: The Medical Press, The Journal of State Medicine, The Journal of the Royal Army Service Corps, Guy's Hospital Gazette, Journal of the Department of Public Health, Wellington, The Asylum News, The Hospital, The Practitioner, Tubercle, The Royal Engineers' Journal, The Indian Journal of Medical Research, The Medical Journal of Australia, Tropical Diseases Bulletin, Publications of the South African Institute for Medical Research, Commonwealth of Australia Quarantine Service, Transactions of the Society of Tropical Medicine and Hygiene, Public Health, The Indian Medical Gazette, The Medical Journal of South Africa.

Foreign: Le Bulletin Médical, Surgery, Gynaecology and Obstetrics, Giornale di Medicina Militare, The Military Surgeon, Abstracts of Bacteriology, Archives Médicales Belges, Journal de Genève, Office International d'Hygiène Publique, La Caducée, Archives de Médecine et Pharmacie Navales, Bulletin de l'Institut Pasteur, Japanese Medical Journal, The Journal of Infectious Diseases, Bulletin of the Johns Hopkins Hospital, Annali di Medicina Navale e Coloniale.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 9d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," Cornwall House, Stamford Street, S.E. 1, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co.," and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,

"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"

CORNWALL HOUSE, STAMFORD STREET, S.E.1.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

DECEMBER, 1919.

EXTRACTS FROM THE "LONDON GAZETTE."

War Office,

October 7, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign.

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Légion d'Honneur.

Commandeur : Lieut.-Gen. Charles Henry Burtchaell, K.C.B., C.M.G., M.B., K.H.S.

Croix de Guerre.

Col. Charles Mackie Begg, C.B., C.M.G., M.D., F.R.C.P., F.R.C.S., New Zealand Medical Corps.

Capt. and Brevet Major (Acting Lieut.-Col.) Gilbert Henry Dive, D.S.O., Royal Army Medical Corps.

Capt. Sidney Martin Hattersley, M.C., M.B., Royal Army Medical Corps.

Capt. Tom Ramsden Kenworthy, M.C., Royal Army Medical Corps (Territorial Force).

Temp. Capt. Arthur Cecil Laing, M.B., Royal Army Medical Corps.

Major George Waterston Miller, D.S.O., M.B., T.D., Royal Army Medical Corps (Territorial Force).

Temp. Capt. Edwin Fitzgerald O'Connor, M.B., Royal Army Medical Corps.

Capt. Herbert B. Pope, M.C., Royal Army Medical Corps (Territorial Force).

Capt. Frank Wigglesworth, M.C., M.B., Royal Army Medical Corps (Territorial Force).

Major George F. Whyte, M.B., T.D., Royal Army Medical Corps (Territorial Force).

76665 Pte. John Cresswell Armstrong, 104th Field Ambulance, Royal Army Medical Corps (Low Fell, co. Durham).

303054 Serjt. (Acting Staff-Serjt.) Alexander Cameron, 1/3rd (Highland) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Fochabers).

305012 Staff-Serjt. John Crabbe 2/3rd (Highland) Field Ambulance Royal Army Medical Corps (Territorial Force) (Dundee).

65750 Pte. (Acting Serjt.) Ernest George Waterman Mattick, 102nd Field Ambulance, Royal Army Medical Corps (Brighton).

Ordre du Merite Agricole.

Officer : Major Arthur Edmund Stewart Irvine, D.S.O., Royal Army Medical Corps.

Médaille des Epidémies (d'Or).

Temp. Capt. William Arthur Anderson, M.B., Royal Army Medical Corps.

Capt. Charles Frederick Morris Saint, C.B.E., M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Capt. Richard Woodward Swayne, O.B.E., M.B., Royal Army Medical Corps (Territorial Force).

Médaille des Epidémies (en Vermeil).

Capt. John Dale, O.B.E., M.B., Royal Army Medical Corps (Territorial Force).

Médaille des Epidémies (en Argent).

Col. George Dansey-Browning, C.B.E., late Royal Army Medical Corps.

Capt. and Brevet Major (Acting Lieut.-Col.) Gilbert Henry Dive, D.S.O., Royal Army Medical Corps.

Capt. Robert Dunlop Goldie, M.B., Royal Army Medical Corps (Special Reserve).

Temp. Capt. (Acting Major) Thomas Clark Ritchie, O.B.E., M.D., Royal Army Medical Corps.

Médaille de l'Assistance Publique (en Argent).

Temp. Capt. Carlyle Aldis, M.B., Royal Army Medical Corps.

Temp. Capt. Alexander Baldie, M.B., Royal Army Medical Corps.

Col. Albert Louis Frederick Bate, C.M.G.

Major George Edward Ferguson, Royal Army Medical Corps.

Capt. Walter Fitzpatrick, Royal Army Medical Corps (Territorial Force).

Capt. Thomas James Kelly, M.C., M.B., Royal Army Medical Corps.

Temp. Capt. Henry Charles Semon, M.D., M.R.C.P., Royal Army Medical Corps.

Médaille de l'Assistance Publique en Bronze.

3592 Pte. Bert Blows, Royal Army Medical Corps (Royston Herts.).

6460 Pte. (Acting Cpl.) Frederick William Alfred Craylen, Royal Army Medical Corps (Pas de Calais).

20102 Cpl. William Rees Price, Royal Army Medical Corps (Beaufort, Mon.).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE HELLENES.

Greek Military Cross.

2nd Class.—Capt. (Temp. Major) Thomas Henry Peyton, D.S.O., M.D., Royal Army Medical Corps (Territorial Force Reserve); Capt. and Brevet Major (Acting Lieut.-Col.) Maurice Joseph Williamson, M.C., M.B., Royal Army Medical Corps.

3rd Class.—Temp. Capt. William Henry Hooton, Royal Army Medical Corps; 493006 Qmr.-Serjt. (Temp. Serjt.-Major) Charles Abnett, D.C.M., 1st Home Counties Field Ambulance, Royal Army Medical Corps (Territorial Force) (Maidstone); 42062 Staff-Serjt. (Acting Serjt.-Major) William James Post, M.M., 66th Field Ambulance, Royal Army Medical Corps (Redhill).

DECORATIONS CONFERRED BY THE PRESIDENT OF THE PORTUGUESE REPUBLIC.

Military Cross of Avis.

Grand Officer.—Major-Gen. John Joseph Gerrard, C.B., C.M.G., M.B.

Commander.—Major John Humphrey Barbour, M.B., Royal Army Medical Corps.

Col. Alfred Bertram Soltau, C.M.G., O.B.E., M.D., F.R.C.S., Army Medical Service (Territorial Force).

London Gazette, Number 31560, dated September 20, 1919.

Page 11758—For "Gold Medal for Value" read "Gold Medal for Valour."

Page 11759—For "Silver Medal for Value" read "Silver Medal for Valour."

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.

October 10, 1919.

The King has been graciously pleased to give orders for the following promotions in, and appointments to the Most Excellent Order of the British Empire, in recognition of distinguished services rendered during the war:—

To be an Officer of the Military Division of the said Most Excellent Order:—

Major Edward Cecil Clements, Royal Army Medical Corps (Territorial Force).

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street.

October 14, 1919.

The King has been graciously pleased to give directions for the following promotions in, and appointments to, the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with the war. Dated June 3, 1919:—

To be additional Members of the Second Class, or Knights Commanders of the said Most Distinguished Order:—

Col. and Hon. Major-Gen. Robert Samuel Findlay Henderson, C.B., M.B., retired pay (late Royal Army Medical Corps).

Temp. Major-Gen. Sir Bertram Edward Dawson, G.C.V.O., C.B., M.D., Army Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.

October 14, 1919.

The King has been graciously pleased to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire, for valuable services rendered in connexion with the war. Dated June 3, 1919:—

To be Knight Commanders of the Military Division of the said Most Excellent Order:—

Capt. and Brevet Lieut.-Col. (Temp. Col.) Sir Harold Jalland Stiles, Knt., M.B., F.R.C.S., Royal Army Medical Corps (Territorial Force).

Lieut.-Col. William Thornburn, C.B., C.M.G., M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

South African Force.

Lieut.-Col. Edward Newbury Thornton, C.B.E., South African Medical Corps.

War Office,

October 14, 1919.

The King has been graciously pleased to approve of the undermentioned rewards for valuable services rendered in connexion with the war. Dated June 3, 1919:—

To be Honorary Colonel under Act 77 Royal Warrant:—

Lieut.-Col. A. E. Morris, M.D. (retired pay), late Royal Army Medical Corps.

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,

October 23, 1919.

The King has been graciously pleased to give directions for the following appointments to the Most Distinguished Order of Saint Michael and Saint George for services rendered in connexion with the Defence with Kut-al-Amarah. Dated June 3, 1919:—

To be an Additional Member of the Third Class or Companion of the said Most Distinguished Order:—

Lieut.-Col. John Hennessy, C.B., Royal Army Medical Corps.

War Office,

October 23, 1919.

The King has been graciously pleased to approve of the undermentioned rewards for distinguished service in connexion with the Defence of Kut-al-Amarah. Dated June 3, 1919:—

AWARDED THE DISTINGUISHED SERVICE ORDER.

Lieut.-Col. Edgar Francis Hardley Baines, Indian Medical Service.

Major Charles Harrison Barber, M.B., Indian Medical Service.

Capt. (Acting Major) Arthur Skelding Cane, O.B.E., M.D., Royal Army Medical Corps.

Capt. Edward Geoffrey Stayne Cane, Royal Army Medical Corps.

AWARDED THE MILITARY CROSS.

Capt. John Startin, Royal Army Medical Corps.

War Office,

October 23, 1919.

The names of the undermentioned Officers should be added to the list of Mentions in Dispatches published in the *London Gazette* of October 19, 1916 (page 10059):—

Major E. A. Walker, M.B., F.R.C.S., Indian Medical Service.

Capt. P. B. Bbarucha, D.S.O., F.R.C.S., Indian Medical Service.

Capt. (Acting Major) A. T. J. McCreery, M.C., M.B., Royal Army Medical Corps.

Capt. L. Murphy, D.S.O., Royal Army Medical Corps.

War Office,

October 24, 1919.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and medals in question.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

Ordre de Leopold II avec Croix de Guerre.

Chevalier.—33650 Pte. (Acting Serjt.) William Borrow, 42nd Field Ambulance, Royal Army Medical Corps (Ryton-on-Tyne).

Croix de Guerre.

69513 Serjt. Roy. Pickard, 136th Field Ambulance, Royal Army Medical Corps (Waterfoot, near Manchester).

Décoration Militaire avec Croix de Guerre.

- 32087 Pte. Alfred French 44th Field Ambulance, Royal Army Medical Corps (Walthamstow).
 53539 Staff Serjt. James Graham, 104th Field Ambulance, Royal Army Medical Corps (Bloomfield-by-Annau).
 9866 Serjt. Arthur Papworth, 93rd Field Ambulance, Royal Army Medical Corps (Tooting, S.W.).
 41192 Cpl. Wilson Foster Quinn, D.C.M., M.M., 109th Field Ambulance, Royal Army Medical Corps (Belfast).

DECORATIONS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Légion d'Honneur.

- Officier.*—Major-Gen. Edward George Browne, C.B., C.M.G., late Royal Army Medical Corps.
Chevalier.—Capt. and Brevet Major Thomas John Carey Evans, M.C., F.R.C.S., Indian Medical Service.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE HELLENES.

Order of the Redeemer.

- Officer.*—Major Alexander Edward Kidd, O.B.E., M.B., Royal Army Medical Corps (Territorial Force).
Chevalier.—Capt. Archibald Oliver, M.D., Royal Army Medical Corps (Territorial Force).
 Capt. William Arthur Valentine, M.D., Royal Army Medical Corps (Territorial Force).

Order of King George I.

- Commander.*—Lieut.-Col. Cathcart Garner, C.B.E., M.B. (retired pay).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF ITALY.

Bronze Medal for Military Valour.

- Temp. Capt. George Thomson Mowat, M.B., Royal Army Medical Corps.

DECORATIONS CONFERRED BY THE PRESIDENT OF THE PORTUGUESE REPUBLIC.

Military Order of Avis.

- Commander*: Temp. Major and Brevet Lieut.-Col. Frederick S. Brereton, C.B.E., Royal Army Medical Corps; Col. Murray MacLaren, C.M.G., Canadian Army Medical Corps; Temp. Col. Charles Ferdinand Martin, Canadian Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.

Order of St. Sava.

- 5th Class.—Capt. J. K. Mossman, M.C., Canadian Army Medical Corps.

Samaritan Cross.

- 32011 Serjt.-Major Adkins, 41st General Hospital, Royal Army Medical Corps (Woolwich).
 481023 Staff-Serjt. Ronald Trevor Alderton, 41st General Hospital, Royal Army Medical Corps (Cambridge).
 100382 Pte. Arthur Boardwell, 36th General Hospital, Royal Army Medical Corps (Burnley, Lancs.).
 28269 Qmr.-Serjt. (Temp. Serjt.-Major) Alfred Brookes, 41st General Hospital, Royal Army Medical Corps (Crewe).
 23706 Staff-Serjt. Joseph George Collier, 37th General Hospital, Royal Army Medical Corps (Cross Keys, Newport, Mon.).
 11628 Staff-Serjt. Thomas Arthur Fullam, Royal Army Medical Corps (Margate).
 79169 Pte. (Acting Cpl.) Ernest John Garwell, 41st General Hospital, Royal Army Medical Corps (Spalding).
 105894 Pte. Robert Henry Gaynor, 36th General Hospital, Royal Army Medical Corps (Birkenhead).
 1975 Serjt. (Acting Staff-Serjt.) William Hawkes, 38th General Hospital, Royal Army Medical Corps (West Bromwich).
 28769 Pte. John William Illingworth, Royal Army Medical Corps (Conisboro', Rotherham).
 5180 Pte. (Acting Cpl.) Wilfred John Jones, 38th General Hospital, Royal Army Medical Corps (Birmingham).
 44427 Pte. Charles Ellis Ketteringham, 8th Battalion, Shropshire Light Infantry (formerly 36th General Hospital, Royal Army Medical Corps) (Attleborough).
 62593 Serjt. John McCullagh, 37th General Hospital, Royal Army Medical Corps (Caum Killinardish, co. Cork).
 11952 Serjt.-Major Albert Edward Malley, 38th General Hospital, Royal Army Medical Corps (Southampton).
 11027 Serjt.-Major John Henry Masters, Royal Army Medical Corps (Penton Mewsey, Andover, Hants).
 12618 Staff-Serjt. (Acting Qmr.-Serjt.) William Austin Mayman, Royal Army Medical Corps (Deal, Kent).
 42031 Pte. James Maxwell, 9th Battalion, Gloucestershire Regiment (formerly 38th General Hospital, Royal Army Medical Corps) (Linlithgowshire).

83801 Serjt. Gilbert Charles Reakes, 37th General Hospital, Royal Army Medical Corps (Bristol).

83936 Pte. Bertram Goodwin Williams, 41st General Hospital, Royal Army Medical Corps (Reigate).

57424 Staff-Serjt. Frank Algernon Wood, 37th General Hospital, Royal Army Medical Corps (Stroud, Gloucestershire).

ARMY MEDICAL SERVICE.

Col. William T. Mould, C.M.G., retires on retired pay, dated October 10, 1919.

Col. Harold V. Prynn, C.B.E., D.S.O., retires on retired pay, dated October 26, 1919.

Col. Sir William H. Horrocks, K.C.M.G., C.B., M.B., retired pay, relinquishes the temporary rank of Brigadier-General on ceasing to be re-employed, dated November 1, 1919.

Col. Wilfred W. O. Beveridge, C.B., C.B.E., D.S.O., M.B., to be Director of Hygiene at the War Office, and to be Temporary Brigadier-General whilst so employed, dated November 1, 1919.

Col. Corynden W. R. Healey, C.M.G., retires on retired pay, dated October 21, 1919.

Col. Albert G. Thompson, C.M.G., D.S.O., M.B., is placed on half pay. Dated November 15, 1919.

ROYAL ARMY MEDICAL CORPS.

Major Robert G. Archibald, D.S.O., M.B., from the half pay list, retires, receiving a gratuity, dated October 23, 1919.

The undermentioned Captains from Territorial Force, to be Captains:—

Dated March 28, 1918.—Frank Rex Fletcher, M.B., but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below A. N. Minns.

Dated February 10, 1919.—Harry Taylor Findlay, M.B., but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below J. A. Binning.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to October 1, 1919:—

Dated April 7, 1918.—Capt. Kingsley Louis O'Sullivan, from Special Reserve, with precedence next below J. J. Magner.

Dated May 16, 1918.—Temp. Capt. George Dugal Yates, M.B., with precedence next below R. A. Anderson.

Major Colin Cassidy, M.C., M.B., is restored to the establishment, dated October 14, 1919.

Capt. David S. Martin, M.B., relinquishes the acting rank of Major, dated May 18, 1918.

Capt. Clifford Halliday Kerr Smith, M.C., M.B., from T.F., to be Captain, dated May 1, 1918, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below T. F. Kennedy.

The undermentioned relinquishes his commission:—

Dated October 25, 1919.—Lieut. (Temp. Capt.) Douglas J. Valentine, M.C.

Capt. (Acting Major) Wilfrid W. Treves, O.B.E., M.B., F.R.C.S., to be Acting Lieutenant-Colonel, from November 22, 1918, to June 20, 1919.

The undermentioned to be Acting Lieutenant-Colonels whilst commanding Medical Units:—

Dated March 27, 1919.—Major Thomas E. Harty, D.S.O.

Dated May 15, 1919.—Major Harold W. Farebrother.

Dated June 12, 1919.—Capt. and Brevet Major Robert E. Barnsley, M.C.

Dated June 24, 1919.—Major Gerald H. Stevenson, D.S.O., M.B.

Capt. Geoffrey D. Harding, M.B., to be Acting Major, dated October 28, 1919.

Capt. Thomas P. Buist, M.B., is seconded for service under the Civil Administration of Mesopotamia, dated April 1, 1919.

Lieut. (Temp. Capt.) Archibald A. B. Scott, M.B., to be Captain, dated September 4, 1919.

The undermentioned to be Acting Lieutenant-Colonels:—

Dated May 1, 1919.—Major Edmund T. Potts, C.M.G., D.S.O., M.D.

Dated June 21 to October 14, 1919.—Capt. David C. G. Ballingall, M.C., M.B.,

Dated October 23, 1919.—Major Alexander J. Williamson, M.B., whilst specially employed.

The undermentioned to be Temporary Captains:—

Dated June 27, 1919.—Lieut. Charles V. Macnamara, M.B.

Dated July 4, 1919.—Lieut. James C. Coutts, M.B.

Dated September 5, 1919.—Lieut. Charles A. Whitfield, M.B.

Dated October 3, 1919.—Lieut. John E. Rea, M.B.

Temp. Lieut.-Col. Edward P. Cathcart, M.D., relinquishes his commission, dated September 1, 1919, and retains the rank of Lieutenant-Colonel.

Major A. W. A. Irwin to be Acting Lieutenant-Colonel, dated June 2, 1919.

The undermentioned Majors to be Acting Lieutenant-Colonels whilst especially employed:—

Dated September 12, 1919.—John L. Wood, O.B.E.

Dated September 26, 1919.—Archibald S. Littlejohns, D.S.O.

The undermentioned relinquish the acting rank of Major on ceasing to be specially employed:—

Dated October 8, 1919.—Capt. Richard B. Phillipps.

The undermentioned to be Acting Majors whilst specially employed :—

Dated September 1, 1919.—Capt. and Brevet Major William L. Webster, M.B.

Dated October 19, 1919.—Capt. Robert S. Cumming, M.C., M.B.

The undermentioned Temporary Captains to be Captains, but not to reckon for pay or allowances prior to October 1, 1919 :—

April 10, 1918.—(Acting Major) Stanley Fenwick, M.C., M.B., and to retain his acting rank, with precedence next below C. K. G. Dick

Dated November 3, 1918.—William Russell, M.C., M.B., with precedence next below J. H. Bayley.

Dated August 1, 1919.—George Jackson, M.C., M.B., with precedence next below T. C. Bowie.

The undermentioned relinquish the acting rank of Major :—

Dated July 13, 1918.—Capt. Joseph W. O'Brien, M.C., M.B.

Dated February 13, 1919.—Capt. Treffry O. Thompson, M.D.

Dated February 15, 1919.—Capt. William E. Tyndall, M.C., M.B.

Dated February 16, 1919.—Capt. Joseph P. Quinn, M.C., M.B.

Dated February 21, 1919.—Capt. Cassidy de W. Gibb.

Dated March 7, 1919.—Capt. John H. Pendered, M.C., M.B., F.R.C.S.

Dated July 8, 1919.—Capt. William T. Graham, O.B.E., M.B.

Dated July 11, 1919.—Capt. William B. Allen, V.C., D.S.O., M.C., M.B. ; Capt. Thomas B. Nicholls, M.B.

Dated October 1, 1919.—Capt. Alexander L. Aymer, M.B.

Dated October 13, 1919.—Capt. Charles G. G. Keane.

The undermentioned Majors to be acting Lieutenant-Colonels whilst commanding medical units :—

Dated December 1, 1918.—Leopold A. A. Andrews.

Dated August 19 to October 9.—Charles M. Drew, D.S.O., M.B.

The undermentioned Majors relinquish the acting rank of Lieutenant-Colonel :—

Dated May 22, 1919.—Ernest B. Lathbury, O.B.E.

Dated September 19, 1919.—Joseph E. H. Gatt, M.D.

Dated September 27, 1919.—Alfred W. A. Irwin.

The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel :—

Dated February 9, 1919.—Brevet-Colonel John Powell, D.S.O., M.B.

Dated February 17, 1919.—Arthur W. N. Bowen, C.B.E., D.S.O.

Dated March 13, 1919.—Brevet Col. Lawrence Humphry, C.M.G.

Dated March 14, 1919.—Dermot O. Hyde, C.B.E., D.S.O.

Dated March 16, 1919.—John H. Campbell, C.B.E., D.S.O.

Dated March 20, 1919.—Bernard B. Burke, C.B.E., D.S.O.

Dated March 31, 1919.—Horace S. Roch, C.M.G., D.S.O. ; Basil F. Wingate, D.S.O.

The undermentioned Lieutenant-Colonels relinquish the acting rank of Colonel :—

Dated March 4, 1919.—Henry Hewetson, D.S.O.

Dated March 12, 1919.—Albert E. Hamerton, C.M.G., D.S.O.

Dated March 13, 1919.—William L. Steele, C.M.G.

Dated March 17, 1919.—Herbert R. Bateman, D.S.O.

Dated March 31, 1919.—George M. Goldsmith, C.B.E., M.B.

Dated April 3, 1919.—Brevet Colonel William R. P. Goodwin, D.S.O.

Dated April 13, 1919.—Brevet Col. William R. Blackwell, C.M.G.

The undermentioned relinquishes the Acting rank of Lieutenant-Colonel on ceasing to command a Medical Unit :—

Major John du P. Langrishe, D.S.O., M.B. Dated April 15, 1919.

The undermentioned Lieutenants (temporary Captains) to be Captains :—

Dated October 3, 1919.—William H. Ferguson, M.C., M.B.

Dated October 7, 1919.—John A. Crawford, M.D.

Dated October 28, 1919.—Percy R. O'R. Phillips.

The undermentioned relinquish the acting rank of Lieutenant-Colonel :—

Dated July 6, 1919.—Major and Brevet Lieut.-Col. Frederick W. Lamballe, M.B., on ceasing to be specially employed.

Dated September 13, 1919.—Capt. James B. A. Wigmore, M.B.

Dated September 27, 1919.—Major Robert J. Franklin.

Temp. Capt. Harold Godfrey Parry Armitage to be Lieutenant, and to be Temporary Captain, dated September 6, 1917, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below J. C. Burns.

Temp. Capt. Bruce Malaher to be Captain, dated January 26, 1919, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below R. Stowers.

Capt. (acting Major) William McMeekin Chesney, M.C., M.B., from Special Reserve, to be Captain, dated February 9, 1918, with precedence next below J. Walker, but not to reckon for pay or allowances prior to October 1, 1919, and to retain his acting rank.

Temp. Capt. Kenneth Noel Purkis, M.C., to be Captain, dated February 14, 1919, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below J. F. Bourke.

Capt. Frederick George Flood, M.C., M.B., from Special Reserve, to be Captain, dated

March 28, 1918, with precedence next below A. L. Aymer, but not to reckon for pay or allowances prior to October 1, 1919.

Capt. Hawtrey William Browne, M.C., M.B., from Territorial Force, to be Captain, dated March 30, 1918, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below R. G. Martyn.

Major and Brevet Lieut.-Col. Eugene Ryan, C.M.G., D.S.O., relinquishes the temporary rank of Lieutenant-Colonel, dated April 5, 1919.

Temp. Capt. Thomas Scott Law, M.B., to be Lieutenant, and to be Temporary Captain, dated June 19, 1916, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below W. E. Hodgins.

Capt. George Maclean Campbell, M.C., M.B., late Royal Army Medical Corps, to be Captain, dated July 10, 1918, but not to reckon for pay or allowances prior to October 6, 1919, with precedence next below F. Harris.

Capt. Forbes J. Stuart, M.B., to be Major, with seniority next below Major G. Petit, M.C., dated July 29, 1919.

Capt. Arthur L. Foster to be Acting Major whilst specially employed, dated August 1, 1919. (Substituted for the notification in the *Gazette* of October 2, 1919.)

Capt. Donald Cameron Bowie, M.B., from Special Reserve, to be Lieutenant, and to be Temporary Captain, dated August 29, 1918, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below J. C. Coutts.

Temp. Capt. George Harold Wood, M.B., to be Captain, dated October 13, 1918, but not to reckon for pay or allowances prior to October 1, 1919, with precedence next below J. T. McConkey.

Major William J. S. Harvey, D.S.O., relinquishes the temporary rank of Lieutenant-Colonel, dated October 15, 1919.

Capt. Kenneth P. MacKenzie, M.B., is seconded for service with the Egyptian Army, dated October 17, 1919.

Lieut.-Col. and Brevet Col. Gilbert J. A. Ormsby, D.S.O., M.D., relinquishes the acting rank of Colonel, dated October 29, 1919.

Major and Brevet Lieut.-Col. Ralph B. Ainsworth, D.S.O., to be Acting Lieutenant-Colonel whilst specially employed, dated October 31, 1919.

Lieut.-Col. James E. Brogden, half pay list, retires on retired pay on account of ill-health, dated November 11, 1919.

Major and Brevet Lieut.-Col. Frederick D. G. Howell, D.S.O., M.C., relinquishes the temporary rank of Lieutenant-Colonel, dated November 12, 1919.

Lieut.-Col. and Brevet Col. Lawrence W. Harrison, D.S.O., M.B., K.H.P., retires on retired pay. Dated November 18, 1919.

Lieut.-Col. Charles W. H. Whitestone, M.B., is placed on retired pay. Dated November 17, 1919.

Major Whiteford J. E. Bell, D.S.O., M.B., relinquishes the Acting rank of Lieutenant-Colonel on reposting. Dated March 3rd, 1919. (Substituted for the notification in the *Gazette* of August 25, 1919.)

Capt. Arthur P. O'Connor, M.C., M.B., to be Acting Lieutenant-Colonel whilst commanding a Medical Unit, from August 9 to September 22, 1919.

Capt. Arthur P. O'Connor, M.C., M.B., to be Acting Major. Dated September 23, 1919.

The notification in the *Gazette* of July 1, 1919, regarding Capt. and Brevet Major Alexander G. J. MacIlwaine, C.I.E., is cancelled.

Temp. Capt. Ronald Stevenson Dickie, M.B., to be Captain. Dated May 2, 1919, but not to reckon for pay or allowances prior to November 1, 1919, with precedence next below W. H. A. D. Sutton.

Capt. James J. D. Roche, M.B., to be Acting Lieutenant-Colonel whilst commanding a Medical Unit, from March 28 to June 12, 1918.

The notification in the *Gazette* of July 11, 1919, regarding Capt. G. P. Taylor, D.S.O., M.C., is cancelled.

Capt. George P. Taylor, D.S.O., M.C., M.B., relinquishes the Acting rank of Lieutenant-Colonel. Dated September 27, 1919.

ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND.

NOTICE.

THIS Fund provides annuities of £50 a year during widowhood, to the widows of officers who have held permanent commissions in the Royal Army Medical Corps. In the event of the death of the widow this annuity is continued to the children of such marriage until the youngest attains the age of 21 years. It also continues for their benefit, up to the same age, if the widow re-marries. Furthermore, should the wife of the subscriber predecease him, it will be optional for him to continue the subscription he had been paying as a married member,

in order to provide an annuity similar to the above for the children of the marriage, until the youngest shall have attained the age of 21 years.

Provision is also made whereby a part of the surplus at any quinquennial valuation may be applied for the benefit of members, or their widows, or orphan children. Thus, by the appropriations of surplus at the valuations of December 31, 1910 and 1915, the prospective widows of first-class married members on the books at those dates will receive, during this current quinquennium, £200 and £100 respectively at the death of their husbands, their annuities being also increased to the statutory limit of £52.

Unmarried members pay an annual subscription of £2, and on passing to the married class are allowed the equivalent of all past subscriptions in the unmarried class by way of reduction of their annual subscription in the married class.

Examples of the annual subscription for married members which, if it exceeds £10, may now be paid in equal half-yearly instalments, are :—

Husband's Age				Wife's Age				Annual Subscription
25	..	..	..	20	..	..	..	£13 8 5
30	..	..	..	27	..	..	..	£14 6 1
36	..	..	..	33	..	..	..	£16 17 2
46	..	..	..	40	..	..	..	£22 12 6
50	..	..	..	45	..	..	..	£24 9 5

The Secretary will be glad to give any further information as to details.

3, Homefield Road,
Wimbledon, S. W. 19.

J. T. CLAPHAM, *Captain,
Secretary.*

THE BENEVOLENT AND RELIEF FUNDS OF THE CORPS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—As Secretary of the Army Medical Officers' Widows and Orphans Fund—a life Assurance Society for the Regular Officers of the Corps—I have in the last few months received from war areas, from Archangel to East Africa, credit balances of canteens and institutes which have been closed. These gifts are obviously intended for one of the several charitable Funds of the Corps. As to the nature of these, there seems to be much misapprehension. If this merely entailed on me the endorsing and passing on of cheques I should not venture to trouble you. But in each case I have to write to the sender, explain the various Funds and their scope, and ask to which the money shall be allotted. When the reply comes money orders and notes have to be distributed. If you could kindly find space for the following brief description it might save time and trouble all round.

I am, Sir,

3, Homefield Road,
Wimbledon, S. W. 19.
November 4, 1919.

Your obedient servant,
J. T. CLAPHAM, *Captain.*

ROYAL ARMY MEDICAL CORPS OFFICERS' BENEVOLENT SOCIETY.

The object of this Society is to afford relief to the orphans of Regular Officers of the Corps who may be left in distress, and to help to procure for them a better education than their limited means would otherwise permit.

GENERAL RELIEF BRANCH OF THE ROYAL ARMY MEDICAL CORPS FUND.

This Fund gives help in cases of distress occurring among warrant and non-commissioned officers and men of the Royal Army Medical Corps, past and present, and their wives, widows and children.

The Secretary of these two Funds, which it will be noted deal solely with Regulars, is Lieut.-Col. E. M. Wilson, C.B., C.M.G., D.S.O., 124, Victoria Street, S.W. 1.

AUXILIARY ROYAL ARMY MEDICAL CORPS FUNDS.

For the benefit of officers, warrant officers, non-commissioned officers and men of the New Army, the Territorial Force and the Special Reserve.

(a) Officers' Benevolent Branch.

This Fund helps in educating children of officers of the Auxiliary Royal Army Medical Corps who have lost their lives during the present war, or have been severely disabled by it.

(b) Relief Branch.

Helps the widows and children of warrant and non-commissioned officers and men of the New Army, Territorial Force, and Special Reserve.

The Honorary Secretary of these Auxiliary Royal Army Medical Corps Funds is Col. Sir W. Hale White, K.B.E., 11, Chandos Street, Cavendish Square, W. 1, to whom requests for help, as well as subscriptions, should be addressed.

AUXILIARY ROYAL ARMY MEDICAL CORPS FUNDS.

THE usual Quarterly Committee Meeting was held on Friday, October 31, at 11, Chandos Street, Cavendish Square, W. 1. Five grants were made to cases in the Benevolent Branch for Officers, amounting to £350 and sixty-two grants in the Relief Branch for the rank and file amounting to £2,007 5s.

These Funds are for the relief of widows and orphans of commissioned officers and non-commissioned officers and men of the rank and file of the Royal Army Medical Corps, Special Reserve, Territorial Force and New Armies, and also for the relief of the children of those who have been so severely damaged in the present war that they need help for the education of children. Requests for relief should be addressed to the Hon. Secretary, at the Offices of the Funds at 11, Chandos Street, Cavendish Square, W. 1.

ROYAL ARMY MEDICAL CORPS CENTRAL MESS FUND.

SUMMARY OF THE PROCEEDINGS OF A SPECIAL MEETING OF THE COMMITTEE WHICH WAS HELD AT THE ROYAL ARMY MEDICAL COLLEGE ON NOVEMBER 6, 1919.

Present :

Brevet Lieut.-Col. P. Davidson, C.M.G., D.S.O., Aldershot Division, in the Chair.

Major G. A. D. Harvey, C.M.G., Curragh Mess.

Brevet Lieut.-Col. W. Benson, D.S.O., Rawal Pindi Mess.

Capt. C. M. Rigby, London Mess.

Capt. L. Murphy, D.S.O., Southern Command.

Brevet Major T. A. Weston, Cosham Mess.

Capt. T. E. Osmond, London District.

Letters were read from Major T. S. Blackwell (Aldershot Mess), and Major D. B. McGrigor (Northern Command) regretting their inability to be present.

(1) The Minutes of the previous Meeting were read and confirmed.

(2) The receipt of £31 18s. 6d., being the credit balance of the Mess Fund of the late First Army Royal Army Medical Corps School of Instruction, was reported from Major-General Sir H. N. Thompson, K.C.M.G., C.B., D.M.S., Army of the Rhine. Also, earlier in the year, £1 16s. from Lieut.-Col. L. F. K. Way, on behalf of 101st Field Ambulance, and 14s. 2d. from Lieut.-Col. H. J. Fletcher, balance of the late Royal Army Medical Corps Mess at Crowborough.

A letter was read from Lieut.-Col. P. J. Hanafin, late Officer Commanding 13th Field Ambulance, saying that he proposed to send a silver cup, won by that unit, to the Mess at the Curragh unless the Committee wished it to go elsewhere. The Committee entirely agreed with his suggestion.

(3) The Chairman explained the necessity for establishing a new Mess at Tweseldown Camp, four miles from Aldershot, to which the Royal Army Medical Corps Depot has been moved. As it will be no longer possible for the officers of the Depot to remain members of the Aldershot Mess it was resolved that the new Royal Army Medical Corps Depot Mess be recognized by the Central Mess Committee as one of the permanent messes of the Corps. Considerable expense being incurred in the opening of this Mess it was further unanimously resolved that a grant of £150 be made to the Mess, and also a loan of £150, without interest, repayable within five years by annual instalments of not less than £30.

(4) The question of a grant towards the cleaning of the oil paintings in the London Mess, which had been suspended at the last meeting, was again raised. It was reported that the Memorial Branch of the Royal Army Medical Corps Fund had made a grant of £115 to clean those paintings in the Mess which came under the head of memorial pictures. The cost of the absolutely necessary work on the remaining gift pictures was £60. It was unanimously resolved that a grant of this amount be made.

(5) The Hon. Secretary was directed to forward a copy of the following resolution to the Commandant of the Royal Army Medical College: "That in view of the heavy demands which have been made on this Fund by the Mess at the Royal Army Medical College, the Committee feel

strongly that His Majesty's Government should be again approached with a request for a grant to this Mess. The Committee would point out that this Mess is not that of any particular unit of the Corps, but that it was formed to accommodate officers during their attendance at the Royal Army Medical College."

(6) A grant of £25 was made to the Curragh Mess for the repair of the billiard table.

(7) Payment of a printers' bill of £1 12s. 6d. was sanctioned.

(8) It was resolved that, to obviate selling securities at the present time, Messrs. Holt and Co. be asked to allow the banking account of the Fund to be overdrawn, during the next four months, to the extent necessary to meet the expected calls on the Fund, say £250, on the security of the bonds held by them for the Central Mess Fund.

3, Homefield Road,
Wimbledon, S.W.

J. T. CLAPHAM, Captain,
Hon. Secretary.

UNIVERSITY OF ABERDEEN.

ROLL OF SERVICE.

Names and addresses of persons who attended one or more classes, but did not graduate at this University, and who took part in the Great War, or in work arising out of the War, will be gratefully received by the Editor, Roll of Service, Marischal College, Aberdeen.

ANNUITY FUND FOR DISABLED AND NECESSITOUS NURSES.

THE Members of the Nursing Staffs of Queen Alexandra's Imperial Military Nursing Service and Reserves serving in Military Hospitals and Hospital Ships throughout the war have contributed the sum of £6,000 for the formation of annuities for disabled and necessitous Nurses. This sum has been entrusted to the Trained Nurses Annuity Fund for administration, and a seat on the Council of this Fund has been granted to the Service to form a link between the subscribers and their memorial annuities. Three annuities are now in operation and a further seven will be available in January, 1920. The nominations are in the gift of the Matron-in-Chief, the War Office.

BIRTH.

LOUGHNAN.—On October 9, 1919, to Eileen, wife of Major W. F. M. Loughnan, M.C., Royal Army Medical Corps, a son.

DEATH.

THOMSON.—Reported wounded and missing, Mesopotamia, on March 25, 1917, now officially presumed to have died at Kirkuk on April 22, 1917, Capt. Wilfred Burrell Thomson, M.C., 2nd Dorset Regiment, dearly loved second son of Lieut.-Col. W. B. Thomson, Royal Army Medical Corps (retired)), and Mrs. Thomson (late of Hardingstone, Northants).

Capt. Wilfred Burrell Thomson, the second son of Lieut.-Col. W. B. Thomson, Royal Army Medical Corps (retired), was educated at Felstead and Sandhurst. Shot for Ashburton Shield and Spencer Cup (Bronze Medal). Gazetted to 2nd Dorset. Left with Regiment for Mesopotamia in 1914. Wounded at Shaibu, Kut el-Amara, Ctesiphon (severely), and Takel Hamrin, 1917. Mentioned in Dispatches; awarded M.C.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

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Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are

inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 56, Cornwall House, Stamford Street, S.E. 1.

Communications have been received from the following: Col. S. F. Clark; Lieut.-Cols. J. C. G. Ledingham, C.M.G., and E. P. Sewell; Majors J. F. Mayne, A. C. Amy, E. B. Smith and D. Embleton; Capts. M. E. MacGregor, J. W. Tudor Thomas and A. H. Priestley; Professor J. S. Haldane, F.R.S., N. M. Baylis, Esq., H. M. Woodcock, Esq., J. Bancroft, Esq., C.B.E., F.R.S., Serjt.-Major E. B. Dewberry.

The following publications have been received:—

British: The Journal of State Medicine, The Medical Press, The Medical Review, Medical Science, Abstracts and Review, The Hospital, The British Journal of Surgery, The Journal of the Royal Army Service Corps, Guy's Hospital Gazette, The British Journal of Tuberculosis, Illustrated "Barts" Chronicle, Journal of the Royal Naval Medical Service, Proceedings of the Royal Society of Medicine, The Quarterly Journal of Medicine, The Journal of Tropical Medicine and Hygiene, Edinburgh Medical Journal, New Zealand Public Health, Hospitals and Charitable Aid Department, The Royal Engineers' Journal, The Practitioner, Tropical Veterinary Bulletin, The Medical Journal of Australia, The Medical and Dental Defence Union of Scotland, Seale Hayne Neurological Studies, St. Mary's Hospital Gazette, Report of the Director-General of Public Health, New South Wales, 1917, St. Thomas's Hospital Gazette, Indian Medical Gazette, St. Bartholomew's Hospital Journal, Public Health, Edinburgh Medical Journal, Tropical Diseases Bulletin, The Medical Journal of South Africa, Review of the Foreign Press.

Foreign: Medicina Militar, Le Bulletin Médical, Norsk Tidsskrift for Militærmedicin, Giornale di Medicina Militare, United States Public Health Service, Library of Congress, Washington, Surgery, Gynaecology and Obstetrics, Bulletin de l'Institut Pasteur, Office International d'Hygiène Publique, L'Ospedale Maggiore, Archives Médicales Belges, Le Caducée, Le Bulletin Médical, La Faculté de Médecine de l'Université de Paris, Zeitschrift für Militärärzte Herausgegeben vom Sanitätskorps, The Journal of Infectious Diseases, The Military Surgeon, Archives de Médecine et Pharmacie Navales.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

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Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," Cornwall House, Stamford Street, S.E. 1, and must reach there not later than the 30th of each month for the alteration to be made for the following month.

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